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NEW TRENDS IN DEVELOPMENTAL PSYCHOLOGY*

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WHAT I would like to do is to consider the strategy of research in pre-school education, and to make a plea to developmental and educational psychologists to take more account than most of us do of the environmental forces which impinge directly on the child, and which influence both his development and his educational progress. Since, however, I am billed to talk about recent advances in child development generally, I shall first say a few things about new trends which are relevant to pre-school studies.

Perhaps the most significant thing about child development is that it continues to follow an exponential curve of growth. Developmental psychology is one of the very few areas which is selected for *annual* coverage in the *Annual Review of Psychology*, and each year the reviewers list between 200 and 400 references, while at the same time apologising for the inadequacy of their coverage. *Child Development Abstracts* now contains about a thousand items a year, and the journal *Child Development* reported in an editorial last December that they had received 309 papers for publications during 1967 as compared with 73 a decade earlier. This is both heartening and intimidating to those who profess this field of study.

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Secondly, one of the most rewarding developments is the growth of interest in experiment. By that I don't mean what often passes for experiment in psychology, and in particular educational psychology, namely the comparison of groups, but real experiment in which the effects of deliberately and systematically changed conditions are assessed against the appropriate control conditions. Research workers are much more likely today than in the past to turn to experiment to answer questions which would formerly have been investigated by tests or observational studies. One thinks not only of Piaget and Luria and Lipsett and Kagan and Schaffer and O'Connor, and the behaviour modifiers, and of the vast range of animal experiment on developing organisms of different species, but of experiments which are actually going on in classrooms and in group situations. Among these the i.t.a. experiments on reading and the pre-school studies in the United States and elsewhere are the best known.

Thirdly, today there is a refreshing emphasis on the importance of *early* development. Benjamin Bloom, in what must be one of the most expensive best-sellers to have resisted cheap publication in paperback form, maintains on the basis of careful analysis of follow-up studies with intelligence tests that 50 per cent of the 17-year-old intelligence level is already determined by four years. Douglas's work confirms the importance of the early home environment on a child's progress in school, and the long-term follow-up studies carried out by Skeels and Skodak have vindicated their pre-war work on the effects of differential placement of deprived children in infancy. In a somewhat different context, the difficulty of achieving good results in remedial education underlines the importance of the early *school* years for the mastery of basic skills. We don't know much about ' sensitive ' periods in early development, but most people believe that they exist.

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* A verbatim record of the opening address to the annual conference of the Education Section of the British Pyschological Society at the Froebel Educational Institute, London, on September 12th, 1969.

Fourthly, whereas only a few years ago comparative psychology was almost synonymous with the maze learning, bolus dropping and lever pressing by the adult rat, the centre of interest is today on environmental factors influencing development and behaviour. To the non-specialist the work of Hebb and Harlow, and in a different way the influence of ethology, are the most significant indicators of the change in orientation. However, even the classical problems of maze-learning and lever pressing by the rat are today being approached quite differently, and these traditional experimental situations are being used to answer a whole new range of problems which were never examined and never indeed raised in the laboratories of Hull and Tolman. Particularly interesting is the work of Denenberg and his colleagues in Tulane University, who are minutely and completely controlling and programming the whole life span of successive generations of rats to see the effects of different types of environmental experience, at different ages, not only on the behaviour of adult rats, but on the behaviour of their offspring. Using a large colony of rats and elegant experimental designs they are reporting highly complex yet replicable interactions between behaviour in adult life and early experience, and are showing differential effects of different types of early environmental deprivation and enrichment upon the behaviour not only of mothers, but of their offspring. This work, like Harlow's, is of the highest importance to developmental psychologists, even if they deal with the wild breeding species, *homo sapiens*, and even if the possibilities open to them of experiment in a strict sense are negligible.

Pre-school studies.

I want to turn now to work which is going on in the pre-school area. Pre-school education in the United States started on a mass scale as recently as 1965 when the Headstart programme began, following the Economic Opportunity Act of 1964 which has since been given the rather grizzly title of the War on Poverty. In Britain pre-school play groups started a little earlier but the provision for *mass* pre-school education was given a forthright commendation by the Plowden Committee. Of course, pre-school education has a much longer history and the basis for our present methods of nursery schooling was laid by the Macmillan sisters, Susan Isaacs, Dorothy Gardner and others in this country and by other distinguished educators from Froebel onwards in Europe and elsewhere. What I think is new today, both in the United States and Britain, is that officialdom is showing an increased interest in early education, and educational psychologists, who have hitherto for the most part not had much to do with pre-school children, are now becoming involved in their educational problems.

Nursery education of the kind that has shown an orderly development over the years is being challenged today, ostensibly on the basis of experimental findings in developmental psychology, by those who say it is all right for middle-class children, but unable to cope with the backwardness and alienation of children from deprived environments. Broadly speaking, there are today, according to Casden, three competing types of programme. The first is that of our modern nursery schools in which there is rather little explicit control and direction by teachers over the form of children's intellectual activity. Children are free within very broad limits to select stimuli which they wish to respond to, and divergent responses to those stimuli are valued. These programmes assume that working-class children are more like their middle-class age-mates than different from them, and so continue to focus on all aspects of the child's development.

At the other extreme are the programmes of carefully sequenced instruction supposedly tailored to meet the specific needs of working-class children. As Casden says, programmes which are by nature the most highly explicit and structured, in which the curriculum can be easily described and made available to others, are likely to become more fashionable because they appear to deal with specific problems and to tell teachers exactly how to cope with them. It is a characteristic of today's highly structured programmes (of which Bereiter and Engelmann's is the best known) that they pay remarkably little attention to dramatic play, or to emotional and social goals. The emphasis is on increasing intellectual competence, particularly through language drill.

In between these two comes another group of programmes, of which that by Susan Gray and Robert Klaus in Peabody College, Nashville, is perhaps the best known. These programmes share features of the other two groups.

How are we to judge these programmes and choose between them ? The accepted way today is to specify some objectives, to look around for or devise some tests, and to do some pre- and post-testing to measure effects. Occasionally a control group is used, but controlled experiment is rare (and more often than not, half-hearted) and Hawthorne effects are not easily avoided.

Narrowness of Criteria.

It is, of course, good that attempts are being made to evaluate pre-school programmes, but though I greatly welcome all this activity I question whether the approach usually followed today is going to take us far. The weaknesses in evaluation seem to me to arise from the narrowness of the criteria which are proposed by the evaluators, their failure to concern themselves with biological and social variables, the lack of interest in the analysis of the *educational* situation, and, in this country, the uncritical acceptance of ideas which may be more relevant to the American scene than to ours. Let us look at these.

First, the narrowness of the criteria. By this I mean that the be-all and end-all of education is considered to be an increase in score on some test or other. Now if one uses the Peabody Language Programme and tests progress on the Peabody Picture Vocabulary Test, one is likely to reach the pleasing conclusion that the children, after a good deal of drill on related material, improve their scores on the Peabody Picture Vocabulary Test. Likewise, if one uses the Frostig Programmes and Frostig pre- and post-testing. However, whatever the test, it may not tell us very much about the child's actual use of language in everyday situations ; and it will tell us nothing at all about a host of other educationally important variables.

The failure to consider biological and social variables is perhaps less a fault of the educators than of the politicians who are always seeking inexpensive and rapid cure-alls for deep-seated and intractable social problems. If educators fall for this line of thinking there is a danger that in their effort to improve the lot of deprived and socially handicapped children they will also deceive themselves that education is a cure for all social ills, or even that better education will in itself cure the problems of backwardness and alienation. Surely it can do something : but it may not be much, and if the social environment is hostile or unsupporting, the effects of pre-school education are likely to be small and short-lived. And if we judge pre-school education by inappropriate criteria, we may end up by throwing out the bath with the bathwater.

A third weakness of evaluation studies in this country is that, at a time when the Plowden Report is receiving most favourable attention in the United

States, and when increasing numbers of American visitors are coming to see the best of our nursery schools and infant schools, we seem to be taking over uncritically ideas which were developed to meet a very different situation. My colleague, Basil Bernstein, who has directed what is probably the most imaginative and best controlled study of enrichment in the infant schools anywhere in the world, has pointed out to me that there are two differences between the American situation and ours. On the one hand, the children who come to the slum schools in the ghetto areas of the United States are grossly more backward, alienated and deviant from the mainstream of American culture than are the children who enter our infant classes. Secondly, the American teacher is much more geared to the idea of programming, to receiving directions, to following the book than is her British counterpart, who is likely to be resourceful, independent and flexible in her approach to the children.

Finally, if we are to carry out evaluation studies, it is essential that we look at what actually goes on in school. Wiseman has said that in methods experiments most of the variance is between-teacher variance; yet we persisently ignore this in experimental education. I should like to make a plea that for the time being developmental educational psychologists should forget about individual differences in children, and look instead at individual differences in teacher behaviour, at the factors in school organisation and in teacher-training which contribute to these, and at the effects of the teacher, rather than of the formal programme, upon the children.

For some years my colleagues and I have followed a similar strategy in our studies of the effects of residential upbringing on mentally retarded children and pre-school children in residential care. Because I always feel uncomfortable in giving papers which don't report empirical work I shall describe the strategy, which seems to me applicable to education. We first focused on the child's environment, salient aspects of which we tried to define in a rigorous and operational manner. Then we went on to look both at factors in the wider social environment which determine differences in child upbringing patterns, and at the effects of differing methods of upbringing on the development of children. Studies have now been carried out in 102 child care units in 26 establishments and I think we are all convinced of the possibilities this approach seems to offer.

Enormous differences.

At the outset of our inquiries we were struck by the enormous differences in the manner in which mentally retarded children were brought up in residential *homes*, run on child care principles, and in mental deficiency *hospitals*. My colleagues, Mr. King and Dr. Raynes, devised a simple and objective scale of child management practices which enabled us in quantitative fashion to measure child upbringing practices. These varied in different institutions from patterns which were strongly child-oriented to those which were institutional. In child-oriented units the children were given individual rather than block treatment, personal clothing as opposed to institutional clothing, variety as opposed to uniformity in regimen. Between units in children's homes and wards in mental deficiency hospitals caring for the same type of child there was no overlap in scale scores on the child management scale. The most institutional unit in *any* of the children's homes we studied was far more child-oriented than the least institutional unit in any of the mental deficiency hospitals.

My colleagues carried out intensive, quantitative time-sampling studies of aspects of the micro-environment of the children, looking particularly at the manner in which the head of the unit acted. In institutionally-oriented units the head of the unit spent a high proportion of her time in administrative work rather than in child care. This may seem paradoxical because a hospital ward sister has fewer responsibilities than the head of a children's home, who has not only to look after the children but also to arrange the cooking of their meals, their clothing, and a host of other things which are done by specialised departments in hospitals. Moreover, the heads of units in children's homes do their work largely without supervision, so they have many more opportunities to retreat into the office and engage in busy work. However, in fact they spend more time rather than less with the children, they talk to them more, they share more of their responsibility with other members of staff, and they are much more likely than their counterparts in the hospitals to be doing menial tasks just like everybody else.

But even within a single type of establishment, namely the children's homes for the severely subnormal which were all fairly child-oriented, there were differences in child management practices. These were strongly related to the type of training which the head of the unit had had. Those who had had a child care training were significantly more child-oriented in their child management practices than were those who had had a nurse training, and it was not only the head of the unit who behaved in a way that reflected the nature of her training, but the whole unit which was geared to one or other of these types of policy. Thus we showed that the head of the unit has a determining rôle in child management practices throughout the unit. If she was trained to think in institutional terms she ran a small institution ; if she was trained in child care she ran an establishment in which individual treatment and the personal needs of children were given the highest priority.

We have also looked, though as yet in less detail, at the effects of different types of child management practice upon children. Taking only institutions in which the children were matched closely for age and IQ, ability to walk and child-staff ratios, we found that children in institution-oriented establishments were markedly more retarded in their language and in a number of other social skills. When rated by nurses or housemothers on the behaviour problems which they presented, very many more children in the hospitals were found to be aggressive, over-active, destructive, attention-seeking and given to tantrums. From half to two-thirds of all the children in the wards of mental deficiency hospitals which we investigated were reported to present these behaviour problems in marked or moderate form. By contrast, only about a quarter of children were similarly rated in the children's homes. It is possible, of course, that there were some selection factors at work, though we tried to control for these by matching children by severity of handicap in the different kinds of units. Interestingly enough, we also found that there was no difference between severely retarded children in children's homes and in hospital wards in the proportion who were reported to be withdrawn, liable to run away or given to self-injury. It was in acting out, destructive and aggressive behaviour that the two groups differed.

So, by making the children's environment the focus of our study, we were able to point to factors which could readily account for these differences. And by turning to the factors in the wider institutional organisation we were able to offer some reasons—which were sociological rather than psychological—to explain why good-hearted and sincere people behave in a way towards children which everyone recognises to be detrimental to their welfare.

Obsessive concern with tests.

I suggest that in our pre-school studies and in education generally it is time to focus more attention on the classroom and the teachers. Surely we have much to learn about teaching from the study of the different ways in which teachers behave and the ways children respond to them. If our interest is in language development, we can find out which teachers stimulate language in their classes and how they do it; and then we can apply the lessons to teacher-training, to in-service courses and so on. If children are not speaking as we would wish them to, and not reading as well as we think they should, let us try to find out why before we begin to translate the findings of short-term laboratory experiments into class-room curricula. Personally, I think we have more to gain at present from the study of educational *processes* than from the study of educational products—products that is, in the form of IQ changes, significant improvements on standardised tests and what not. Such things are by-products rather than end-products of a good education, and our concern with them tends to be obsessive. Surely our aim is to get children working under their own steam, expressing their ideas fluently and precisely, reading for pleasure and interacting happily with adults and with other children. If we do this these by-products are likely to accrue. But I think we will only make the rather general goals of primary education more explicit and operational, and only find out how better to attain them, if, in our study of the factors affecting the development of children, we include the parents, the school, the teachers and what goes on in the school and in the classroom.

Perhaps I should summarise the argument which may have been rather long-winded.

I pointed out that research in the rapidly developing subject of child psychology is turning more and more to experiment to answer questions formerly not raised at all or dealt with only by observational studies. Much more attention is being paid today to *early* development, and in animal work in particular, most fascinating and important studies are being done, with animals of different species, to determine the specific effects of different types of experience, at different ages. Not only is behaviour at the time and in adult life being studied, but also the behaviour of the offspring. So specific are the effects of different environmental pressures according to the age at which they are applied, the animal's previous history and so on, that developmental psychologists, such as Denenberg, are finding it necessary to 'programme' the whole life experience of their rats in order to untangle the effects of different experiences.

In human experimentation we cannot, fortunately, achieve any comparable precision, nor would we wish to. But there is no reason why methodologically we should remain so primitive in our thinking. In educational psychology much of what we do is, I think, as narrow and as sterile as much of the learning theory work of 20 years ago. I suggested we should stop our obsessional scrutiny of attainments for a while and centre our research on the classroom, looking at the quality of education before we worry too much about its end-products. This *doesn't* mean relapsing into the vagueness and sentimentality which the *Black Paper* and *Perspectives on Plowden* satirised. On the contrary, it offers, it seems to me, a way in which the laudable but rather general aims of primary education can be translated into operational terms and our success in attaining them be evaluated and improved.

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A STUDY OF DIFFICULTIES IN READING AND UNDERSTANDING THE JUNIOR EYSENCK PERSONALITY INVENTORY

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SUMMARY. An investigation of a group of fourth-year junior children confirmed that some of them have difficulty in reading and understanding a number of items of the Junior Eysenck Personality Inventory. The findings were that a Reading Age in the region of 8 to 8½ years is probably necessary for reading the inventory, that duller children tend to understand fewer items than brighter children, and that some items are more frequently misunderstood than others. A second investigation failed to support the hypothesis that difficulties in reading and comprehension are associated with differences between the mean scores of dull and average boys on the Extraversion, Neuroticism and Lie Scales.

I.—INTRODUCTION.

EXPERIENCE in using the Junior Eysenck Personality Inventory (S. B. G. Eysenck, 1965) suggested that some children have difficulty in reading and understanding a number of items. It is not usually possible from inspection of completed forms to judge whether such difficulties were experienced, since children tend to answer all the questions whether or not they can read or understand them properly. It was, therefore, decided to investigate the nature and extent of reading and comprehension failure and also to find out whether such failure could be related to differences in mean JEPI scores between groups of children differing in ability and reading level.

II.—THE FIRST EXPERIMENT.

(*a*) *Purpose.*

To investigate the extent to which selected fourth year junior children are unable to read and understand the JEPI.

(*b*) *Subjects.*

17 boys and 19 girls, aged from 10 years 7 months to 11 years 7 months, from two schools were selected to cover a wide range of intelligence and reading achievement. The 10 children at the top of Table 1, with Reading Ages of less than 9 years on the Schonell Graded Word Reading Test (Schonell and Schonell, 1960), constitute the group of poorer readers. The remaining children had Reading Ages above 9 years. Reasoning Quotients from a Moray House test of verbal and visuo-spatial reasoning were available for the better readers, who are grouped in Table 1 according to reasoning ability. The Reasoning Quotients of the upper group were 70, 74, 78, 80, 81, 83, 86, 87 and 89; those of the middle group 92, 95, 95, 96, 96 and 97; and those of the lower group 103, 104, 104, 106, 111, 112, 114, 118, 120, 126, 133. Results from the Progressive Matrices test (Raven, 1951) indicate that half of the poorer readers were of average intelligence; for the other half no intelligence test results were available.

(*c*) *Procedure.*

All of the poorer readers and 10 of the other children with the lowest Reasoning Quotient were asked to read each question, answer it and then explain its meaning orally. Experience with these children established that a number of questions could be read and explained by all children above a relatively low level of intelligence and reading ability; so the remaining children had to read and explain only those questions which had given some difficulty to the others.

TABLE 1

NUMBERS (OR MEAN NUMBERS) OF E, N, and L ITEMS MISREAD AND MISUNDERSTOOD.

Poorer Readers R.A.	Extraversion			Neuroticism			Lie Scale	
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
6·8	20	–	–	20	–	–	6	*
7·4	11	–	–	13	–	–	3	
7·7	6	1	0	3	2	2	4	
7·8	2	4	2	3	4	2	2	
7·8	5	5	4	4	8	7	1	
7·9	7	3	3	5	6	5	1	
8·1	0	4	2	0	5	3	0	
8·3	3	5	3	2	8	7	1	
8·7	1	2	0	0	1	1	0	
8·8	0	4	2	0	3	1	0	
Better Readers (R.A.=>9 yrs.)	MEANS							
R.Q. 70-89 (N=9)	0·44	3·22	1·44	0·22	2·67	1·11	0·22	
R.Q. 90-97 (N=6)	0·00	2·50	0·50	0·17	1·83	0·67	0·00	
R.Q. 100 plus (N=11)	0·00	0·82	0·00	0·00	0·91	0·18	0·00	

*—Only Item 32 misunderstood—by five children.

Key to Columns:

(A), (D), (G)	Items misread.
(B), (E), (H)	Items misunderstood.
(C)	E items misunderstood, excluding items 9 and 41.
(F)	N items misunderstood, excluding items 18 and 26.

(*d*) *Results.*

(i) *Reading*: Table 1 gives in columns (A), (D) and (G) the number of items from the Extraversion (E), Neuroticism (N) and Lie (L) scales each of the poor readers was unable to read, and the mean number in the case of each of the three groups at different Reasoning Quotient levels. The criterion 'unable to read' was met when a child was unable to read a sufficient number of words to be able to grasp the meaning of an item. The figures indicate that considerable difficulty with reading was experienced below a Reading Age of 8·3 years, but little above this level.

(ii) *Comprehension*: Assessing just what a child can and cannot understand of the sort of items contained in the JEPI (or any personality inventory of this nature) is a very difficult and subjective procedure. It was, therefore, necessary always to give a child the benefit of any doubts entertained about his understanding of an item and to arrive at the judgment 'unable to understand' only when sure of its applicability.

For both E and N there are two columns in Table 1 : one giving for each child the number (or mean number for each group) of items not understood and the other the figures that result when, in the case of E, Items 9 and 41 are excluded, and, in the case of N, items 18 and 26 are excluded. This procedure was adopted because these four items gave difficulty over a wide range of ability and, therefore, did not differentiate clearly between the brighter and the duller children.

A dash entered in Table 1 indicates that a child was able to read so few questions that it would have been misleading to record from those he could read how many he could not understand. Also, it was sometimes found that a child who could not read an item could not understand it either when it was read to him. Table 1, however, only takes account of failure to understand those items the children were able to read themselves ; therefore the entries in columns (B), (E) and (H) underestimate a little the extent to which some of the poorer readers failed to understand the inventory.

With both the Extraversion and Neuroticism scales it will be seen from columns (B) and (E) that, as one would expect, the degree of difficulty experienced is related to reasoning level. However, excluding items 9 and 41, and 18 and 26 has quite a marked effect in reducing the numbers of items not understood, as can be seen from columns (C) and (F). The four items are :

E Scale 9. Do you like practical jokes ?
41. Would you call yourself happy-go-lucky ?
N Scale 18. Do you get thumping in your heart ?
26. Are you touchy about some things ?

Nearly all the 20 children who were considered unable to understand Item 9 thought that a ' practical joke ' was a joke that is told to you. Most of the 29 children who failed to understand ' happy-go-lucky ' thought it meant ' happy ' or ' lucky ' or ' happy and lucky.' Although these definitions are wrong, they are not far removed from the correct definitions. Of the 19 children who were judged not to understand Item 18, 11 took it to mean the thumping that follows strenuous exercise and eight thought it meant the normal beating action of the heart that occurs all the time. 23 children did not know the meaning of ' touchy,' and they offered a wide variety of definitions, which, on the whole, did not bear much resemblance to an acceptable definition. Of the remaining 44 N and E Scale items seven were misunderstood by more than four children.

Only one item of the Lie Scale (32. Do you sometimes boast a little ?) was misunderstood by some of the children. None of the definitions of ' boast ' given by these five children was close to the true meaning.

(*e*) *Discussion.*

The evidence of the present investigation tentatively suggests that 10 and 11-year-old children can read the JEPI if they have a Reading Age in the 8 to 8½-year range. The outcome of this direct approach is supported indirectly by the results from samples of children, taken from a large body of data on about 6,000 10 and 11-year-old children (Eysenck and Cookson, 1969) which are summarised in Table 2.

All the children except those in the bottom row of the table were considered by their teachers able to read the inventory. The table contains some clear-cut trends, but the figures should be treated cautiously in view of the subjective element in the teachers' judgments of the reading level necessary for reading the inventory; it is very likely that some children were considered able to read it when they could not and others unable to read it when they could. Although the direct and indirect evidence is not conclusive, it does suggest that it would be desirable for all children attempting the inventory to have a Reading Age of at least 8 years.

TABLE 2

PERCENTAGES OF CHILDREN BELOW THREE READING AGE CUT-OFF POINTS.

	N	Reading Age cut-off points		
		7·5 years	8·0 years	8·5 years
BOYS Verbal Reasoning 90–99	215	0	0	0
BOYS Verbal Reasoning 80–89	82	1	5	11
BOYS and GIRLS Verbal Reasoning 70–79	62	6	26	45
BOYS and GIRLS Unable to read JEPI	76	76	82	96

It is far from possible on the present evidence to arrive at an intelligence level below which children in the age range under investigation would not be able to understand the inventory as a whole. Even so, available findings indicate that a number of the duller children could not understand a fair sprinkling of items and that some average and above average children also had difficulty. On the other hand, it has been shown that although a child may not have grasped the intended meaning of a question, the meaning he did attribute to it was in some cases close to the intended one. Furthermore, it seems possible that an item could have a significant loading on a factor if a similar, clearly erroneous, interpretation of it were adopted by a sufficiently high proportion of subjects.

III.—THE SECOND EXPERIMENT.

(*a*) *Purpose.*

To estimate the effects of reading and comprehension difficulties on between-group differences in mean E, N and L scores.

(*b*) *Subjects.*

The test results of two groups of boys, aged 10 and 11, were extracted from the extensive data mentioned above. One group, of 33 children, had Moray House verbal reasoning quotients in the 70–79 range and the other, of 42 children, had verbal reasoning quotients in the 100–109 range. The latter group was drawn from a larger sub-sample of 162 boys of similar ability and similar scores on E, N and L. Table 3 gives the mean scores of the two groups on E, N and L and Schonell Reading Age.

TABLE 3

MEAN SCORES ON E, N, L AND READING OF DULL AND AVERAGE BOYS.

VR Quotient	(N)	RA	E	N	L
70–79	33	8·79	15·36	14·21	4·76
100–109	42	13·66	18·40	11·93	3·38
DIFFERENCE			3·04**	2·28*	1·38**

* p<·05. ** p<·001.

(*c*) *Procedure.*

The two groups were chosen because the first experiment had suggested that the duller children would have difficulty in understanding and, possibly, reading the JEPI, but that the brighter group would have no serious difficulties. Since significant differences were obtained between E, N and L means for the two groups, it was argued that such differences might have resulted from the reading and comprehension difficulties encountered by the duller group rather than from differences in personality. Findings from the first experiment were used as the basis for investigating this possibility.

(*d*) *Results.*

(i) *Reading*: Since the mean Reading Age of the duller group is 8·79 years, it is unlikely that reading difficulties seriously affected their inventory responses. However, to make a rough check the 32 duller children of known Reading Age were divided into two groups of 16, one with Reading Ages of less than 8·5 years and the other with Reading Ages of 8·5 years and above. Table 4 gives the mean scores of the two groups on E, N and L; none of the inter-group differences are significant.

TABLE 4

MEAN SCORES ON E, N AND L OF DULL BOYS DIFFERING IN READING AGE.

	(N)	VRQ	RA	E	N	L
Reading Age <8·5 yrs.	16	74·00	7·82	15·31	14·25	3·75
8·5 yrs. and over	16	74·06	9·93	15·38	14·12	5·50
Difference				0·07 NS	0·13 NS	1·75 NS

(ii) *Comprehension*: As far as E is concerned, the question here is: Have comprehension difficulties produced the lower mean score in the duller group? To investigate this, the 12 most difficult items were compared with the remaining 12, the prediction being that if being faced with difficulties in understanding produces lower scores in the duller group, then a smaller percentage of the total within-group scoring responses would be contributed by the difficult items in the duller group than in the brighter group. In fact, as Table 5 shows, the difference between the two percentages is small, against the prediction and not statistically significant. Next the four most difficult items were used (excluding those not understood over a wide range of ability), but again the difference is in the wrong direction and not significant.

The same approach was employed with Neuroticism, but this time the 12 most difficult items would have to give rise to a higher proportion of the total score in the duller group since its mean N score is higher. Once more the difference is not significant. Likewise, comparison of the three most difficult N scale items (except those which gave difficulty over a wide range of ability) did not produce a significant difference between the two percentages.

The only Lie Scale items that any children found difficulty with was Item 32; and the difference between percentages of scoring responses it contributes to the two groups is less than in the case of several other items.

TABLE 5

WITHIN-GROUP PERCENTAGES OF E AND N SCALE SCORING RESPONSES OF DULL AND AVERAGE CHILDREN.

	VRQ 70–79	VRQ 100–109	Difference
12 most difficult E items	46·55	45·92	0·63 NS
4 most difficult E items	14·79	13·78	1·01 NS
12 most difficult N items	49·47	51·90	2·43 NS
3 most difficult N items	13·43	14·37	0·94 NS

IV.—CONCLUSIONS.

The first experiment indicated that 10 and 11-year-old boys and girls encounter some difficulty in reading and understanding the inventory. As far as reading is concerned only a relatively small proportion of children in this age group would probably be affected since the Reading Age above which they seem to be able to read the inventory is in the 8 to 8½-year range. One can say little about the level of intelligence required at the age level under study for adequate understanding of the inventory. It has been found that duller children tend to understand fewer items than brighter children and that some items are more frequently misunderstood than others; but the value of these preliminary findings will lie mainly in the extent to which they stimulate further research. The justification for the inclusion of every item in the inventory has, of course, been established by factor analysis, but further detailed investigation of individual items would elucidate their psychological significance.

The second experiment revealed little about the effects of reading level as both average and dull subjects could probably read the inventory satisfactorily. Its main outcome was the failure to support the hypothesis that difficulty in understanding the JEPI is related to difference between mean scores of dull and average boys on the Extraversion, Neuroticism and Lie Scales.

Acknowledgment.—I am grateful to Professor Eysenck for his helpful comments on the manuscript.

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INCONSEQUENCE AS A PRIMARY TYPE OF BEHAVIOUR DISTURBANCE IN CHILDREN

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SUMMARY. In previous studies Stott proposed a type of behaviour disturbance which he named Inconsequence—a failure to reflect upon the consequences of responses resulting in impulsive and often inappropriate behaviour. This article reports (1) an external validation against teacher-judgment of 30 items of the Bristol Social Adjustment Guide hypothesized as indicating Inconsequence; (2) an item-analysis of the proposed 30 indications, of which 26 were judged acceptable; (3) a comparison of the performance of Inconsequential and control children on a test of motor impairment, showing them to be significantly inferior.

I.—INTRODUCTION.

THIS article reports an attempt to identify more adequately a syndrome of behaviour disturbance to which Stott (1966a) has given the name Inconsequence. In his original attempt to classify maladjusted behaviour, which provided the syndromes of the present published edition of the Bristol Social Adjustment Guides, he stopped short of a consistent classification in terms either of the results of behaviour or of the impairment or malfunction of a section of the behavioural system. This was particularly the case with the syndrome of 'restlessness,' which merely represented behaviour inimical to consistently pursued goals.

Closer observation of behaviour previously classified as restlessness suggested that it consists in an inability to inhibit response to stimuli at the primitive physical level. Because of this inhibitional failure the affected individual does not give himself the time to carry through to its completion the mental work which is normally performed upon sensory information preparatory to actual behaviour. That is to say, he is unable to effect a cognitive rehearsal of the consequences of a proposed course of action. In the terminology of Craik (1943) he does not run his mental model of the probable course of events ahead of reality; in Tolman's terminology, he does not test his hypotheses about the outcome of his actions by reference to a 'cognitive map.' On the contrary, he tests them by trial and error in overt behaviour. Describing such children, Kagan (1965) writes: " Their strategy of problem solving has a shotgun character; the child firing a fusillade of answers in the hope that one will be correct. The reflective children, on the other hand, characteristically delay before reporting a classification or solution hypothesis. They actively consider the alternatives available to them and evaluate their differential validity."

By definition, behaviour initiated without considering its consequences either for the agent or for the people and things around him will be maladaptive. The term 'Inconsequential' describes both the type of malfunction and suggests the underlying impairment. (It has been abbreviated to the letter 'Q.')

Indications of inconsequential behaviour in the BSAG were not confined to mere 'restlessness.' By a process of social learning the normal child comes to heed the consequences of indiscriminate demands for attention. He finds it does not pay to seek effectiveness by 'pushing other people around' or by imposing himself in an exhibitionist manner. He learns to restrain his haptic curiosity, to respect the property-rights of others and to inhibit primitive attack responses. Q items were identified in what had previously been classified as attention-seeking (XA) and anxiety for the attention of age peers (XC).

At the time of the publication of the third edition of the manual to the BSAG Stott issued a provisional list of 13 items based upon the BSAG records of 19 children chosen as predominantly inconsequential in that these items accounted for at least half of their total scores. Chazan (1968) tested this ' syndrome ' on a total of 907 children, and suggested from the analysis of the BSAG scores of the 40 Q-children among them that two of the 13 items should be omitted because of their low frequency and two because they were often marked in respect of non-inconsequentials. He proposed the addition of five other items on the grounds both that they discriminated between Qs and non-Qs, and that they fitted meaningfully into the syndrome.

II.—THE VALIDATION OF THE ITEMS OF A PROPOSED NEW ' INCONSEQUENTIAL ' SYNDROME.

From the BSAG an even wider range of items was selected which seemed to have affinities with Inconsequence as defined above. The 30 chosen included the original 13 and the five proposed by Chazan. The ' goodness ' of each item as a member of the syndrome was tested in two ways as described below.

For the first test, teachers of children in the third to the eighth grades (ages 9–14) employed by the Waterloo Separate School Board in Ontario, were given a short description of the Q-type child as given in the appendix. From this population of 726 pupils they nominated 50, of whom 42 were boys. They subsequently completed a BSAG in respect of each of them. This sample was matched with an equal number of control children chosen by date of birth. The number of times each item was marked within each of the groups is shown in Table 1. It is seen that all were marked more frequently for the Inconsequentials. The value of each item as an indicator of Inconsequence was tested by a χ^2 set up as exemplified below for the first item:

	Nominated as Inconsequential	Controls	
No. of times item marked	27	17	44
No. of times not marked	23	33	56
	50	50	100

The levels of significance, summarized from the last column of Table 1, are as follows:

P<·001	22
<·01	4
<·05	1
NS	3

The non-significant items were such because they were hardly marked in respect of these 100 children. Item No. 1, at the ·05 level, is obviously a poor discriminator of Inconsequence and must be rejected. But the four at the ·01 level show a great preponderance of markings on the Inconsequential side (totalling 42 as against only four among the controls), and fail to reach the highest level of significance only because the behaviour is apparently relatively uncommon.

TABLE 1

Inconsequential Syndrome.

Item No.	No. of Times Item is marked		χ^2	P	Earlier synd-drome See foot of table.
	Nominated Inconsequentials (N=50)	Controls (N=50)			
1. Sometimes eager, sometimes does not bother (answering)	27	17	4·06	<·05	X, Ch—
2. Impatient, loses temper with job	4	2	0·71	NS	
3. Flies into a temper if provoked	11	1	9·47	<·01	Ch+
4. Slumps, lolls about	20	2	18·88	<·001	X
5. Over-talkative (tires with constant chatter)	20	3	16·32	<·001	
6. Constantly needs petty correction	37	4	45·02	<·001	X
7. Trades on sympathy or interest	8	0	8·70	<·01	
8. Put out if he can't get attention	13	1	11·96	<·001	
9. Resentful muttering and expression at times	14	3	8·58	<·01	Ch+
10. Plays the hero (when corrected)	9	0	9·89	<·01	
11. Can't resist playing to the crowd	14	0	16·28	<·001	
12. Inclined to fool around (games)	19	0	23·46	<·001	Ch+
13. Over brave (takes unnecessary risks).	4	1	1·89	NS	
14. Likes to be the centre of attention	27	3	27·43	<·001	
15. Shows off (pulls silly faces, mimics, clowns)	20	2	18·88	<·001	Ch+
16. Misbehaves when teachers out of the room	38	1	57·55	<·001	X, Ch—
17. Foolish pranks when with a gang	11	0	12·36	<·001	X
18. Follower in mischief	18	0	21·95	<·001	X, Ch—
19. Squabbles, makes insulting remarks	19	1	20·25	<·001	Ch+
20. Gets very dirty during day	2	1	·34	NS	X, Ch—
21. Starts off others in scrapping and rough play	10	0	11·11	<·001	X
22. Gives up easily (manual)	18	3	13·56	<·001	
23. Is too restless (individual games)	18	1	18·78	<·001	
24. Careless, untidy; often loses or forgets books, pen	45	10	49·49	<·001	X
25. Rough and ready (slapdash, manual)	23	5	16·07	<·001	X
26. Reckless, scatterbrain (classroom jobs)	23	1	26·54	<·001	
27. Too restless ever to work alone	11	0	12·36	<·001	
28. Cannot attend or concentrate for long	42	4	58·13	<·001	X
29. Does not know what to do with himself, can never stick at anything long	30	1	39·32	<·001	X
30. Too restless to remember for long (effect of correction)	28	1	35·41	<·001	X

X original provisional syndrome of 13 items.
Ch+ Chazan's (1968) proposed additions.
Ch— Chazan's proposed deletions.

These included two of the additional items proposed by Chazan (Nos. 3 and 9); the other three that he proposed were significant at the ·001 level (Nos. 12, 15, 19). Of the two whose rejection he advised one (No. 18) was nevertheless significant at this level, while the other (No. 20) was, as he found, hardly marked at all. What proved most gratifying was that—apart from No. 24—the 22 items at the ·001 level were very sparsely marked in respect of the controls. It could, therefore, be concluded that 26 of the 30 items have reasonably good external validity. This, together with the corroboration of the results of Chazan's study, confers a degree of validity to the syndrome as a whole.

For the establishment of a syndrome a test must also be made of the measure of agreement between each single item and those comprising the syndrome as a whole. Such an item-analysis was carried out using the above 100 subjects (50 Inconsequentials and 50 controls) together with 56 maladjusted and/or educationally retarded children referred to the Centre for Educational Disabilities. These 156 children were divided into three equal groups of 52 by their inconsequential scores. This division gave Q-score groupings of 0–5 for the lowest, 6–11 for the middle and 12–21 for the highest category (extreme Inconsequentials).

A ' good ' item was defined as one which had a significantly low representation among the low scorers, and a high one among the high scorers. The evaluation was undertaken not by a 2 df χ^2, which would merely have registered a divergence from a chance distribution in any direction, but by comparing each of the extreme categories independently with an ' expected ' of one-third of the total number marked for the item in question (Guilford, 1956). Of the 30 items thus tested, 18 were doubly significant, as showing low frequency among the low scorers and high among the high, at the ·01 level or above. Seven other items met this criterion except that P was less than ·05 but greater than ·01 in one test. Three of the items (Nos. 1, 13 and 20) failed to reach or barely reached significance on either test; and two (Nos. 2, 10) were non-significant in the comparison of the lowest with the ' expected ' third because of the small numbers. Of these five, three were also non-significant in the comparison of the Qs and controls for the same reason. Except for item 1 with its large number of markings among the normals, and Nos. 2, 13 and 20 which are not worth retaining because of their being hardly marked at all, all the items tested seem to justify their place in the enlarged syndrome. Such a result suggests that the concept of Inconsequence on the basis of which the 30 items were selected for validation, is a useful one.

III.—CONSTRUCT VALIDITY OF THE Q SYNDROME IN TERMS OF MOTOR IMPAIRMENT.

Stott, with Moyes and Headridge, set about the revision of the Oseretzky Test of Motor Ability in order to have some measure of minimal neural impairment which might be used to test the existence of a neurological factor in behaviour disturbance. The result of this work has been the development of almost entirely new batteries of items for each age-group (Stott, 1966b). There are still imperfections in the test which prevent its final publication, but preliminary normative scores were obtained for 511 children aged 7 to 11 years inclusive, taken randomly from schools in and around Guelph, Ontario. These were compared with those for 27 of the Q-children referred to the above Centre for reading disability or behaviour disturbance who had been tested by the same items. The distributions of scores for each group are shown in Table 2.

It is seen from inspection that the Q-children were very inferior in motor performance. Their mean score was 5·89 compared with 1·95 for the controls ($t=7\cdot3261$, $p<\cdot001$). Over 70 per cent of the general normative sample had reasonably good motor ability compared with only 30 per cent of the Qs. This result both gives further construct validity to the Q syndrome and points to a neurological, and probably congenital origin for this form of behaviour disturbance. To date no test has been made of whether Q-children are differentially more motor-impaired than other types of maladjusted children.

TABLE 2

INCIDENCE OF MOTOR IMPAIRMENT AMONG INCONSEQUENTIALS AND NORMATIVE SAMPLE.

Score category	Per cent passing	
	Inconsequentials (N=27)	Controls (N=511)
0–2 (Normal)	30·0	70·5
3–5 (Slightly impaired)	33·3	23·5
6–8 (Moderately impaired)	14·8	4·1
9 and above (Definitely impaired)	22·2	2·0
Mean	5·89	1·95
$t=7\cdot3261$ $P<\cdot001$		

IV.—DISCUSSION.

The validation of the 30 chosen items, first by a test of their agreement with teacher-judgment, and second by their relative frequency among the low and high Inconsequential score groups, justifies the inclusion of 26 of them in an Inconsequential syndrome drawn from the present edition of the BSAG. They are all those in the table except for the three marked NS (2, 13, 20) and item No. 1, for which significance only reached the ·05 level.

Nonetheless, since the original work on the BSAG was carried out before the concept of Inconsequence was arrived at, more apt descriptions than offered by the existing items might be made of this form of behaviour disturbance. Systematic first-hand observations of a number of Inconsequential children in classroom and playground settings have been made in order to see if it was possible to obtain yet better descriptive items. This work will be the subject of a later report.

A minimum score of eight Q items is proposed as the criterion for Inconsequence. The proportion of children meeting it will have to be ascertained. The 7 per cent nominated by the teachers on the basis of the short description is probably too high. Current studies suggest that 5 per cent may be an expected over-all proportion, but it will probably vary with social class and ethnic group. Nevertheless, the great preponderance of Inconsequential boys seems typical. Other current studies indicate that a ratio of 5:1 may be expected from a random sample.

Both Chazan and the present writers have found that 'pure' Inconsequentials, in the sense that they show no other form of behaviour disturbance, are in a very small minority. This does not detract from the value of the concept. The dynamics of behaviour disturbance, as conceptualized from recent work at Guelph, are that certain primary forms of abnormal behaviour, of presumably congenital origin, have their precursors in early childhood. Among the latter is a group which appear to be the counterpart of Inconsequence in the pre-school child. Examples of these are continual uninhibited curiosity and trial and error (meddlesomeness), poor social learning, wandering away from the guarding adult, rash acceptance of strange adults and proneness to accidents. Such children imposed great stress upon their parents and teachers, and when these exceed the limits of tolerance they excite retaliation and/or rejection. The resulting insecurity and anxiety felt by the child tends to generate hostility, and a vicious cycle of bad relationships develops. Hence the initial Inconsequence becomes complicated by secondary complications in the form of hostility, and finally the set anti-social attitudes of the K syndrome. It is our experience that a Q-type child has to be blessed with unusually affectionate and long-suffering parents or teachers for these complications not to develop.

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VI.—APPENDIX—GUIDE TO TEACHERS.

SURVEY OF 'INCONSEQUENTIAL' CHILDREN.

We are attempting to identify all those boys and girls, between the ages of 8 and 14 years, who exhibit a type of behaviour disturbance named 'inconsequence.'

As a class teacher you are asked to list on the attached sheet all those students within the ages specified who answer to the description given below.

The typical 'inconsequential' student shows some or all of the following types of disturbed behaviour:

(1) Doesn't get on with his (her) work because he (she) is easily distracted by others.
(2) Distracts others by provoking them or interfering with them.
(3) Is often the centre of disturbance within the classroom.
(4) Plays the clown in order to raise a laugh.
(5) Shouts out or speaks out of turn.
(6) Does not heed correction, and may play the hero or show off when corrected.
(7) In general reacts very impulsively, and does foolish and occasionally dangerous things.

The names you provide will be treated in strict confidence.

THE EFFECT OF SPECIAL TRAINING ON THE CLASSIFICATORY BEHAVIOUR OF SOME NIGERIAN IBO CHILDREN

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SUMMARY. Twenty Nigerian Ibo children aged about 11 and 12 years, matched with a control group of the same age and number, were trained in classification, using a type of colour-form-size sorting test, and were tested on a transfer task of animal-sorting. On being retested after training the experimental group showed significant improvement. No positive transfer was observed, however, on Kohs Blocks, which were administered as supplementary transfer task. The results indicate the need for a more careful taxonomy of tests of abstraction used in non-Western cultures.

I.—INTRODUCTION.

GOLDSTEIN and Scheerer (1941) in their work on abstract and concrete behaviour have suggested that abstract and concrete attitudes are not learned or improved by training: "They are rather capacity levels of the total personality." Many psychologists now doubt the validity of the characterisation of abstract and concrete as dichotomous behaviour patterns; and some evidence has been produced to show that people can be trained to improve their performance on classificatory tasks (e.g., Strother *et al.*, 1949; Furth, 1966, Clarke and Cooper, 1966; Clarke *et al.*, 1966; Clarke *et al.*, 1967).

The aim of the study reported here was to investigate the effect of special training on the classificatory behaviour of a group of Ibo children. Efficient classification on the basis of superordinate concepts together with the ability to shift the basis of classification depends largely on the possession of a high degree of the abstract attitude. Apart from the theoretical importance of this type of investigation in throwing some light on the nature of abstract behaviour, it is also useful in demonstrating the extent to which the performance of a group of Africans during a session of orthodox psychological testing reflects their capacity levels. Already some psychologists (e.g., Silvey, 1963) are of the opinion that the best approach to mental testing in Africa is to combine it with some training so as to be able to get at what Luria (1961) has called the "zone of potential development," which must be wide in view of the probable cultural constraints on cognitive growth in Africa.

II.—METHOD, SUBJECTS AND PROCEDURE.

Two sorting tasks and Kohs Blocks were used for this experiment. One of the sorting tasks consisted of a collection of plastic models of animals which were well-known to the subjects (goat, dog, sheep, snake, chicken, bird, crocodile, lion, elephant and springbok) and could be classified on the bases of domesticity/non-domesticity, carnivorous/non-carnivorous, reptile/non-reptile/, edibility/non-edibility, etc. The task for training involved a colour-form-size sorting of pieces of plywood.

Forty boys of about ages 11 and 12 in primary school classes 5 and 6, respectively, were selected from schools in two rural areas, Ibusa and Ogwashi-Uku, about six miles apart from each other on the western side of the River

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Niger. The experimental group consisted of 20 boys selected from 48 tested at Ibusa, while the control group consisted of 20 boys selected from 36 tested at Ogwashi-Uku. Both groups were pretested on the animal-sorting task which was also the principal transfer task. The subjects were matched for age, years at school, performance in the pretest and socio-economic background (almost all the parents were illiterate farmers). Ibusa and Ogwashi-Uku are similar culturally, and the schools attended by the children are similar. In both towns accurate birth records are not kept, and so ages were estimated by reference to age-sets and historical events at the time of birth of those subjects whose births were not recorded.

The main hypotheses to be tested were: first, that after training, the experimental group would make more shifts in the sorting task than the control group, and that more children among the experimental group than among the controls would use superordinate concepts to verbalize their bases of sorting; second, that transfer of learning would not be limited to classificatory tasks but would be extended to all tasks involving abstract behaviour—more specifically, the trained group would score higher on average on Kohs Blocks than the untrained group.

Both the control and the experimental groups were first pretested on the animal sorting task. The method of testing was the usual one of asking subjects to put together all the animals that went together or that were alike. Instructions were given in Ibo throughout but subjects were allowed to verbalize in either Ibo or English or both, as they found convenient. The instructions were cross-translated from English to Ibo and back from Ibo to English by two different people as suggested by Frijda and Jahoda (1966). Actual sorting and verbalization were recorded in full for each subject.

The training of the experimental group began two weeks after the pretest. For the training sessions the experimental group were sub-divided into five groups of four children. Each group came for a session lasting almost two-and-a-half hours once a week for four weeks, which meant that each child attended four sessions of about 40 minutes each.

The first session for each group was preceded by a brief introductory statement made to all four members of the group on the purpose of the training and the use of classificatory behaviour in everyday life, giving them the example of the farmer's arrangement and organisation of his yams in the barn as one of the many instances of classificatory behaviour which helps to reduce chaos in man's daily activities. As in the pretesting they were told that they were going to be trained in a type of game All the preliminary talk and actual training were conducted in Ibo, without, however, any cross-translation as there had been in the test instructions.

During each training session, the trainee and the experimenter sat beside each other at a desk. As soon as the trainee was sufficiently relaxed the objects were displayed and he was given the usual instructions for grouping the objects and, later, for the verbalization of the basis of his grouping. He was encouraged to sort in different ways with praise where he made some effort. The trainee was given up to two minutes to try to form groups at the initial trial and during subsequent attempts at shifting from one basis of classification to another. If he was unable to make any groupings in the given period he was asked to stop and watch the experimenter who then brought out some stimulus objects representing different classes. He was then requested to put all the objects that were like the key objects near them. If he got into difficulties in trying to do this the experimenter merely coached him without completing the sorting and he was then asked to furnish reasons for the classification. If the trainee failed to complete the sorting in the allotted time, the experimenter completed it while the child was asked merely to verbalize the basis of the sorting.

During each session not more than three new bases of grouping were introduced, usually starting from additive classes to multiplicative classes, as it was observed that most of the trainees could form and verbalize only the former with relative ease. Observed sources of inefficiency in one session were made the basis of coaching in another. It was possible then to allow every child to progress at his own rate.

Throughout the training sessions, the experimenter tried to encourage the children to state the basis of their sorting simply by using superordinate concepts instead of itemising their bases of sorting. That is, they were encouraged to say, for example: " I have grouped them according to their *shapes* " instead of saying, " These are round; these have three corners; etc." They were also encouraged to analyse the objects conceptually ' in their heads ' as well as looking at them carefully to observe similarities and differences among them. By frequently stressing the need for reflection and asking themselves questions about principles which might facilitate their sorting, the experimenter tried to combat their easily observable compulsion to sort the objects on sight on the basis of attractive and readily perceivable features of the objects. Records were kept of all the active sortings and verbalizations of each trainee together with the type and amount of assistance given by the experimenter at each session. At the end of the training the average number of shifts had increased from 2·7 in the first session to 8·42 in the final session and, on the whole, the verbalization of the bases of groupings by the subjects became less complex.

Four weeks after training both groups were retested on the animal-sorting test and the Kohs Blocks. The Kohs Blocks were administered and scored according to the instructions in the manual. The scoring procedure for the sorting task involved a selection and adaptation of aspects advocated by such investigators as Hanfmann and Kasanin (1936), Thompson (1941), Sigel (1953), Vinacke (1954), Wohlwill (1957); Price-Williams (1962), Bruner and Olver (1963) and Kellaghan (1965).

The results were analysed and classified broadly on the basis of performance and verbalization:

(1) *Performance*: The ability to ' shift ' one's basis of sorting in a sorting task is considered indicative of the degree to which an individual possesses classificatory ability: " a change of criterion or a ' shifting ' is simply another expression of operational, and, therefore, reversible mobility, this being the hallmark of a complete classificatory structure " (Inhelder and Piaget, 1964). A ' shift ' was considered to have been made when a subject broke up the groups he had formed and then formed new groups following some different basis.

(2) *Verbalization:* The verbalized bases of sorting were assigned to levels of abstraction according to three different levels of abstraction:

Level I: The highest level where verbalization was based on superordinate, concepts whether ' itemised ' or not, e.g., domesticity/non-domesticity carnivorous/non-carnivorous.

Level II: Groupings formed on the basis of perceptible attributes and superordinate concepts, e.g., the classification of animals on the bases of domesticity and number of legs at one and the same time.

Level III : Groupings of the following types :

(*a*) Graphic collections and sorting based on contiguity ;
(*b*) Identity and partial identity of certain attributes of the animals ;
(*c*) Affective groupings ;
(*d*) Groupings based on stories ;
(*c*) Naming of the objects.

III.—RESULTS.

For the final analysis, data from only 18 matched pairs (36 subjects) were used. (Two pairs were eliminated because of illness in one of the members.)

The result of the retest on the animal-sorting task showed the difference in the number of shifts between the experimental and the control groups to be significant beyond the 0·005 level (Wilcox matched-pair signed ranks test) An analysis of the verbalized bases of sorting (using the sign test) showed that the trained children used significantly (p=0·05) more superordinate concepts in defining the criteria for their first grouping than the untrained children.

The results of the Kohs Blocks Test were quite different. The scores obtained by the subjects in both the experimental and control groups were relatively poor with two subjects from each group scoring zero. On the Wilcox matched-pair signed ranks test, no significant difference was found between the scores of the two groups. The control group, however, had a slightly higher mean score with 14.7, against the 11·8 average of the experimental group.

The product moment correlation between the number of shifts made in the animal-sorting test and the scores on Kohs Blocks was very low (r=0·16). It would seem, then, that the ability to shift bases of classification in a sorting test is not the same as that required for an efficient performance on the Kohs Blocks, or that the tests sample different aspects of the dimension of cognitive functioning.

IV.—DISCUSSION.

These results confirm the expectation in respect of the sorting task but not of Kohs Blocks. The considerable effect of training on classificatory behaviour indicated by the results are further evidence that some orthodox tests of abstraction may not reveal the capacity levels of individuals but may reflect only the extent to which they have been exposed to experiences that promote the growth of these cognitive functions. They seem to demonstrate, as Inhelder and Piaget (1958) have pointed out, that the realization of an individual's or group's potential ability to perform logical operations " can be accelerated or retarded as a function of cultural and educational conditions."

The factors that may have contributed to the positive transfer of learning observed in this study across classificatory tasks that differ so substantially seem to be many. They may include the following :

(i) mere carrying over by rote verbal labels used for the classification of the objects in the training task ;
(ii) improved understanding of the requirements of the tasks ;
(iii) increased motivation to ' pass ' at the end of the training ;
(iv) some sort of ' Hawthorne effect ' ;
(v) the factors of improved perceptual and conceptual discrimination noted by Clarke and her colleagues in the studies cited earlier.

Because the content of the training task and the transfer tasks were so widely different, the probability that the subjects might have mechanically transferred memorized labels or verbal cues seems to have been minimal: it is doubtful if even any visual cues were carried over. A careful examination of the subjects' verbalized bases of classification of the animals on pretest and retest showed that on both occasions colour and size were not used as bases of groupings; yet these were the concepts that could have been easily transferred by rote to the classification of animals from the repeated classification of plywood pieces of different shapes, colour, size and thickness.

Of the other factors that are suspected to have contributed substantially, the 'Hawthorne effect' seems to be the least important although the probability of its occurrence was quite high. It is unusual for teachers to take as much special interest in their pupils as the experimenter took in the subjects in the experimental group. The special interest shown in the children and the relatively indulgent pattern of the transactions seem to have provided some positive reinforcement for them. The fact, however, that the experimental group did not also perform better on the Kohs Blocks suggests that the 'Hawthorne effect' may not have been great.

The motivation to 'pass' must have been great. In West Africa there exists a cult of school examination success positively reinforced by the value placed on certificates. Where the children saw their training as an extension of their school work they probably developed a commitment to pass when retested on object classifications. That this commitment was not reflected in their performance on the Kohs Blocks test might not be as contradictory to the above explanation as it first appears, since their poor performance might be due to what has been called 'functional fixedness.' This "refers to a situation in which the subject has become so fixed in his perception of an object that he is unable to perceive new or unusual uses for it" (Schulz, 1963), and to the likely event that the children defined their 'examination' as consisting only of the sorting test in which they had received training.

The negative transfer of the effect of training in the classificatory task to Kohs Blocks designs, is not easy to account for. This problem may be approached by examining the usually observed causes of failure to perform relatively well on the Kohs Blocks in non-Western societies (e.g., Jahoda, 1956). The present writer also observed other difficulties among the Ibusa subjects: first, colours were seen merely as discrete strings, not as organised and structured shapes, with the result that they saw the test as concerned mainly with placing the different colours in their proper relative positions without regard to the shapes they formed; second, difficulty in handling part-diagonalled colours to dovetail with others to make a pattern of 'good' shapes; and, third, the difficulty of performing the necessary transformations to equate the top of a design with cubes with design on a flat piece of paper. Perhaps this may be related to the difficulty in organising pictorial material into a 'coherent whole,' pointed out by Deregowski (1966) as fundamental to Zambian children's problem of perceiving three-dimensional models, a difficulty accentuated by the practical manipulatory problem of making designs of shapes out of coloured cubes.

The results highlight the need for a taxonomy of tasks requiring ability for abstraction. It seems no longer useful to write about the abstract behaviour of non-Western peoples on the basis of conventional tests used in Western cultures, for while in Western societies all such tests may intercorrelate, they seem not to do so in some non-Western societies. It may be that most of the tests which led to the earlier assumptions and conclusions about the abstract behaviour of Africans were orientated towards spatial perceptual analyses which are not the same as analyses by means of concepts. The planks which form the operational structures of Western peoples may be different in some ways from those of the subjects in the present study.

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THE STUDY OF ADOLESCENT DEVELOPMENT USING A SENTENCE-COMPLETION METHOD

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SUMMARY. A new sentence-completion test has been constructed in order to explore further the development of interpersonal relationships in adolescence, following an earlier study based on a different type of projective test. The responses of three different age groups of adolescent girls from a grammar school in a working-class area are compared, and the results indicate that in the majority of interpersonal situations there are important differences between age groups, most of which are consistent with those reported in the previous study. The results support the view that a sentence-completion test is an appropriate and significant means of studying interpersonal development.

I.—INTRODUCTION.

IN previous studies (Coleman, 1968, 1969a, 1969b) it has been argued that projective techniques can be used to study child development, particularly those aspects of development which are connected with interpersonal relationships. In the 1969b study pictures were used as stimuli, the children being required to tell a story about each picture, and by analysing the themes expressed by each age group a number of important dimensions of development began to emerge. However, it was felt that further exploration of these dimensions was necessary, preferably with a different technique, in order that some light might be shed on the results from a different angle. For this reason the sentence-completion method was chosen as an additional means of studying the development of interpersonal relationships.

Much work has been done on the use of the sentence-completion method as a diagnostic instrument (for review see Goldberg, 1965), but so far little attention has been paid to it as a means of studying child development. Two exceptions to this have been the papers of Harriss and Tseng (1957) and Lessing, Pribyl and Patek (1966), though both papers have limited their scope by concentrating on positive and negative attitudes to parents and peers, the latter paper making a comparison between normal and disturbed children. In the present study, it was decided to concentrate on the normal adolescent but to investigate a range of interpersonal situations, and for this purpose an entirely new sentence-completion test was developed.

II.—METHOD.

Subjects.

Subjects were 153 adolescent girls from a grammar school in a working-class area of London. They were drawn from the first year (N=52), the third year (N=56) and the sixth year (N=45) of the school, the mean ages of the three groups being 11 : 10, 13 : 9 and 16 : 11. In the first and third years two of the three classes in the school were included, while all the girls in the sixth year took part.

Procedure.

In order that the results should be comparable to those of the previous study (Coleman, 1969b) a sentence-completion test was developed to cover similar interpersonal situations. These include the individual alone, two-person, three-person and group situations. The test will be found in full in the appendix.

The test was completed in the classroom, the instructions being: "I am going to give you a sheet of paper on which you will find some unfinished sentences. I want you to complete these sentences as quickly as you can in the way that you think makes most sense."

Scoring.

For each of the sentences the most common themes were selected and scored. Clearly a selection of common themes is open to personal interpretation, but in so far as was possible the scoring procedure set out by Rotter and Rafferty (1950) was followed. This involves the selection of at least three themes for each sentence, one of which indicates a positive or constructive view of the relationship, one of which reflects conflict, and one of which is neutral. Where it was difficult to follow this procedure (e.g., sentences 2 and 16) it was possible to select three common themes, on the basis that such a theme was one expressed by at least 20 per cent of any one age group.

Interjudge reliability scores were derived for each of the sentences discussed in the present paper. A total of 60 protocols (20 from each age group) were selected at random and scored independently by the author and another experienced clinical psychologist. Interjudge reliability scores were obtained for each sentence, and ranged from 90 to 67 per cent, with a mean of 80·75 per cent.

III.—RESULTS.

The data consist of the proportions of each age group who express the selected themes on each of the sentences. In order to test the significance of differences between age groups χ^2 for k independent samples has been used (Siegel, 1956). Siegel suggests that fewer than 20 per cent of the cells should have an expected frequency of less than five. This has meant that in some cases an important but infrequently expressed theme has not been included in the computation of χ^2 and where this has occurred a note has been added to that effect.

TABLE 1

THE PROPORTIONS OF EACH AGE GROUP EXPRESSING THE DIFFERENT THEMES FOR SELF-IMAGE.

	12 yrs. %	14 yrs. %	17 yrs. %	χ^2	p
Sentence 16:					
Getting older, growing up	38	14	4		
Personal criticism, personal limitation	35	45	47	16·60	<·01
Personal identity	14	13	22		

In Table 1 the results concerning Self-Image are set out. The proportions of each age group who express the three selected themes are significantly different, the theme 'getting older' decreasing markedly with age, while the other two themes show a moderate increase.

TABLE 2

THE PROPORTIONS OF EACH AGE GROUP EXPRESSING THE DIFFERENT THEMES FOR INDIVIDUAL ALONE.

	12 yrs. %	14 yrs. %	17 yrs. %	χ^2	P
Sentence 6 :					
Think things over, feel content	20	34	54		
Feel depressed, lonely, frightened ..	19	14	9	12·70	$<$·02
Activities—read, watch T.V.	44	43	24		
Sentence 13 :					
Think things over, sort things out ..	14	25	51		
Feel lonely, depressed, frightened ..	40	38	16	22·53	$<$·01
Look for others, find something to do	21	9	7		

In Table 2 the results concerning the Individual Alone are set out. Both sentences indicate very similar changes, in that the theme 'thinking things over' increases, while the theme 'depression and loneliness' decreases, with age. In addition, themes related to activity also decrease markedly with age.

TABLE 3

THE PROPORTIONS OF EACH AGE GROUP EXPRESSING THE DIFFERENT THEMES FOR INDIVIDUAL WITH ONE PARENT.

	12 yrs. %	14 yrs. %	17 yrs. %	χ^2	P
Sentence 1 :					
(Girl and Mother) ..					
Get on well, are close friends	19	14	20		
Talk freely about problems, private matters	23	39	38	4·49	NS
Talk, discuss neutral topics	38	39	24		
*Don't get on well, argue	6	6	7		
Sentence 12 :					
(Girl and Father)					
Are close, get on better than mother and daughter	17	27	20		
Do not get on well, are less close than mother and daughter	15	20	18	1·58	NS
Ought to behave in certain ways ...	46	43	56		

* Percentages too small to be included for computation of χ^2.

The results in Table 3 relate to the Individual with One Parent, and show that there are no significant differences between the age groups with respect either to the themes for Sentence 1 (Girl with Mother) or for Sentence 12 (Girl with Father).

TABLE 4

The Proportions of Each Age Group Expressing the Different Themes for Individual With Both Parents.

	12 yrs. %	14 yrs. %	17 yrs. %	χ^2	p
Sentence 4 :					
Parents are necesssary, helpful, supportive	44	54	38	5·06	NS
Parents are restrictive, old-fashioned strict	25	27	22		
Parents ought to behave in certain ways	15	6	18		
Sentence 8 :					
We feel close, like a family, get on well	14	9	22	6·84	NS
Don't get on well, argue, get fed up	8	21	23		
Talk, discuss problems	47	41	38		

The results in Table 4 are concerned with the Individual with Both Parents, and here again there are no significant differences between age groups.

In Table 5 the results concerning Three People situations are set out, indicating significant differences between the age groups. Two themes—' having fun, etc.' and ' exclusion of one person '—increase with age, while the proportion of each group expressing the ' joint activities ' theme gets smaller as the children get older.

TABLE 5

The Proportions of Each Age Group Expressing the Different Themes for Three People.

	12 yrs. %	14 yrs. %	17 yrs. %	χ^2	p
Sentence 3 :					
Have fun, feel secure, happy, part of crowd	15	27	47	14·93	$<·01$
One person is left out, excluded	14	13	9		
Joint activities, discussion of common concerns	58	36	27		
Sentence 11 :					
*Have fun, feel secure, happy......	6	4	13	15·39	$<·01$
One person is left out, excluded	27	39	53		
Argument, disagreement	14	20	11		
Joint activities, discussion of common concerns	37	16	9		

* Percentages too small to be included for computation of χ^2.

Table 6 illustrates the results relating to Group situations. Here there are no significant differences on one of the sentences (No. 5), while on the other (No. 15) there is again a decrease in ' joint activity ' themes, and an increase with age in themes of ' loss of control.'

TABLE 6

THE PROPORTIONS OF EACH AGE GROUP EXPRESSING THE DIFFERENT THEMES FOR GROUP SITUATIONS.

	12 yrs. %	14 yrs. %	17 yrs. %	χ^2	P
Sentence 5 :					
Get on well, have fun, help each other	10	21	33		
Get on badly, argue, make trouble	22	21	15	7·87	NS
Joint activities, discussion of common concerns	44	30	29		
*Lose control, behave differently because in group	0	6	13		
Sentence 15 :					
Have fun, get on well, help each other	23	29	31		
Get on badly, argue, make trouble	14	6	24	17·09	<·01
Joint activities, discussion of common concerns	27	13	6		
Lose control, behave differently because in group	2	9	18		

* Figures too small to be included for computation of χ^2.

In Table 7 the results concerning the Group with One Individual are set out. On Sentence 2, which relates to a person being excluded from a group, it can be seen that there is a decrease in themes of ' loneliness or sadness ' with age, while the older children express a greater proportion of themes of ' independence and individuality.' On Sentence 9, concerned with a leader in a group, a greater proportion of the younger children express themes of ' obedience,' and although there are no differences in themes of ' disobedience ' there is an increase with age of conditional themes, i.e., ' behaviour depends on the circumstances.'

TABLE 7

THE PROPORTIONS OF EACH AGE GROUP EXPRESSING THE DIFFERENT THEMES FOR THE GROUP WITH ONE INDIVIDUAL.

	12 yrs. %	14 yrs. %	17 yrs. %	χ^2	P
Sentence 2 :					
Feels lonely, sad, unhappy, unwanted	60	43	42		
Is on her own, an outsider, an ' odd man out '	25	46	18	33·45	<·01
Is independent, an individualist	0	4	29		
Sentence 9 .					
You should obey, you are meant to carry out the orders	37	25	9		
People disobey, ignore or resent the orders	35	31	33	14·34	<·01
Behaviour depends on the circumstances	12	18	36		

IV.—DISCUSSION.

One of the major reasons for developing a sentence-completion test was to obtain some further evidence relating to the dimensions of adolescent development reported in a previous study which was based on the use of pictures as stimuli (Coleman, 1969b). It was obviously impossible to create two sets of stimuli which were equivalent, and for this reason the results from the one study could not be used to provide direct corroboration or validation of the results from the other study. Nonetheless, the two sets of stimuli could be considered to reflect different facets of the same interpersonal situations, and from this it followed that if the two tests gave different results with regard to changes in an area of interpersonal behaviour, then it could only be assumed that these changes were of limited relevance and applied in specific circumstances to particular groups of adolescents. However, if the results from both tests were consistent then it would be legitimate to conclude that the changes in interpersonal behaviour were of wider relevance and more enduring nature.

With these points in mind some consideration can be given to the results of the present study. Firstly, the results provide no evidence in two areas which were of importance in the previous study. On the one hand, although sentence stems relevant to heterosexual relationships were used (Nos. 7 and 14), the material could not be included as a large proportion of the sample failed to respond appropriately, possibly because they were too defensive regarding this type of relationship. On the other hand there is no evidence to support the result obtained previously indicating that the greatest degree of conflict in a three-person situation is expressed at the 14-year level. Sentence-completion material shows that what awareness there is of conflict in a three-person situation increases with age, the greatest amount being expressed by the 17-year-olds. Here it is clear that further exploration is needed, both of possible sex differences, and of variations in the stimulus situation, for obviously even small changes in the wording of sentence stems can affect responses.

Apart from these two areas a major proportion of the results are consistent with the previous study. Firstly, with regard to the one-person situation, evidence from both studies supports the view that the younger child is more likely to feel frightened or depressed when alone, while the ability to use solitude constructively increases with age. Secondly, as far as three-person situations are concerned, although the evidence on conflict has not been borne out, the expression of co-operative feelings by the 17-year-olds in the previous study is echoed by their expression in the sentence-completion material of a greater proportion of positive or constructive themes for this particular interpersonal situation. Thirdly, this study provides evidence in support of the view that with age there is an increasing ability to develop individual autonomy in relation to the group. Fourthly, differences between age groups concerning dependence on authority figures is also consistent from one study to the other, both results showing that dependence, reflected either in themes of obedience or reliance, is expressed significantly more by the 12-year-olds than by the older children.

Finally, mention must be made of the one area in which the present results indicate no differences between age groups—that of the relationship between children and parents. This is an issue of some considerable interest, especially because of the present controversy concerning the degree of conflict which is present in this relationship. While in the theoretical literature there is much support for the view that conflict with parents is a major feature of adolescence (Josselyn, 1952; Blos, 1962; Blum, 1963), Douvan and Adelson (1966) in an empirical study of a large number of adolescents claim to have found very little evidence of this conflict, and argue that it has been much over-emphasised in the literature. Now it is clear that the results of the present study support the position of Douvan and Adelson, for not only are there no changes with age in themes relating to parents and family, but also the proportion of negative themes in these areas is remarkably low throughout the age range.

In closing, some assessment is needed of the value of sentence-completion material in studying development. While it is clear that some alterations are necessary in the form of some of the sentence-stems (e.g., those concerned with heterosexual relationships) the results illustrate important changes in all interpersonal areas except those concerned with parents and family situations. Furthermore, in spite of the fact that the two studies have been based on different samples, both in terms of sex and socio-economic background, the majority of the results show a remarkable degree of consistency. Thus there is little doubt that a sentence-completion test can tap significant areas of development, and can be used as an additional projective technique in the exploration of adolescent personality.

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VI.—APPENDIX.

Complete these unfinished sentences as quickly as you can :

1. When a girl and her mother are together
2. Someone who is not part of a group
3. If I am with two friends
4. For a girl parents
5. A group of people often
6. When there is no one else around I
7. Sometimes a girl and a boy
8. As soon as my parents and I are together
9. When someone gives orders to a group
10. To other people I seem
11. Usually when three people are together
12. I think that a girl and her father
13. If a person is alone
14. When I am with a boy friend
15. People in a group
16. Now and again I realise that I

THE RELIABILITY AND VALIDITY OF SELECTED TESTS OF CREATIVE THINKING IN A SAMPLE OF SEVENTH-GRADE WEST AUSTRALIAN CHILDREN

By KATHLEEN DEWING

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SUMMARY. Four tests from the Minnesota Tests of Creative Thinking (two verbal and two non-verbal) were administered to 394 Grade 7A children from 10 metropolitan schools in Perth, Western Australia. All tests were scored for fluency (number of responses) and originality (infrequent responses). Data were also collected relating to five measures of creative performance in real-life situations, within and outside the classroom.

Test-retest reliability for the tests of creative thinking were consistently higher for non-verbal than verbal tests, and for fluency than originality.

A highly significant relationship was found between scores on the tests of creative thinking and the measures of creative performance.

It was not assumed that the performance measures would be related to each other (creativity in one sphere does not imply creativity in another) but a moderate amount of generality was, in fact, found. In most cases the average correlations between measures were between 0·150 and 0·350 (N=394). The teacher and peer ratings of creativity in school were clearly related, as were the two questionnaires concerned with leisure activities. Imaginative writing was related to both in-school and out-of-school measures.

The correlation between the total creative thinking score and IQ on the ACER Intermediate Test D was 0·143 ($p < \cdot 05$). Within the high-creative thinking group (the top 20 per cent on the tests) differences in performance were not related to intelligence.

No sex differences were observed with regard to either test scores or creative performance.

I.—INTRODUCTION.

SOME years ago McNemar (1964) complained that certain tests, typically scored for novel responses or novel solutions to problems, are claimed to be measures of creativity " with no evidence whatsoever that the tests have predictive value for non-test real-life creative performance." A considerable amount of research has now been carried out based on these tests, but it is still true that relatively little has been published about their validity. The information that is available is scanty, limited, and not always easy to find. It is probably true to say, however, that in the main it is hopeful.

Guilford (1961) reports significant correlations between creativity tests and measures of creative activity derived from a biographical inventory in a study of aviation cadets by Zaccaria *et al.* (1956) and Sprecher (1957) found tests of fluency and originality predicted peer and supervisor ratings of creativity of engineers. Other validity studies are reviewed by Garwood (1961, 1964). More recently, Laynor (1966) cites small but significant correlations between selected tests from the Minnesota battery and creativity ratings by art and English teachers of 200 eighth-grade children. On the other hand, Duenck (1966) failed to find a relationship between scores on the Minnesota tests and either teacher creativity ratings or specific creative performance in an industrial arts course.

II.—PLAN OF THE INVESTIGATION.

The present study was designed to examine the relationship between scores on four of the Minnesota Tests (two verbal and two non-verbal) and five measures of creative performance in a sample of seventh-grade children. Parallel forms of the tests were administered with a six-week interval, allowing test-retest reliability to be taken into account.

(i) *Subjects.*

The subjects were 394 Grade 7A children from 10 metropolitan primary schools in Perth, Western Australia. All children reached the age of 12 during 1965. The mean intelligence quotient in each school given by ACER Intermediate Test D ranged from 109·1 to 117·5. The mean IQ for the whole sample was 113·9, with a standard deviation of 10·5.

The schools were chosen by the Research Branch of the West Australian Education Department using two criteria:

(1) Headmasters with a co-operative and progressive attitude to research;

(2) Grade 7A teachers of superior calibre who were likely to be interested in the subject of the study.

Since Torrance (1965, pp. 80-83) has demonstrated that creative thinking scores " increase sharply when the teacher himself is interested in creativity," it is possible that the schools selected were above average in creativity.

It is improbable that they were above average in socio-economic level. In Western Australia headmasters are assigned to schools, as the schools become vacant, in the order that their names appear on a promotion list. Class teachers are also appointed in order as vacancies arise. There is thus no systematic relationship between any characteristic of the teachers when appointed and the location of the school.

(ii) *Instruments.*

Creative thinking tests: The tests of creative thinking were:

(1) Alternate uses: tin cans

(2) Alternate uses: bricks

(3) Circles

(4) Squares

from the Minnesota Tests of Creative Thinking. These are described by Torrance (1962a, pp. 213-253) and in the "Administration and scoring manual for abbreviated form VII Minnesota tests of creative thinking" (Torrance, 1962b).

The first two are verbal, and require the subject to write down as many unusual uses for common objects as he can. The second two are non-verbal and involve drawing objects using the given circles or squares as a base. All tests were scored for fluency (number of responses) and originality (infrequent responses).

This is a departure from the Torrance scoring method which adds together the scores for four different factors, and is based on the Wallach and Kogan (1965) argument that an individual's creative potential is affected by two basic variables: " The number of associations the person can generate in response to given tasks, and the relative uniqueness of the associations that he produces."

Originality was calculated by tabulating and counting all responses. A weight of 0 was given to responses produced by more than 5 per cent of the subjects, 1 to those produced by 2 to 5 per cent and 2 to those given by less than 2 per cent. A total creativity score was formed by standardising all eight sets of scores and adding them together.

Measures of creative performance: There were five measures of creative performance:

(1) Teacher ratings of in-school creativity,
(2) Peer ratings of in-school creativity,
(3) A check list of 100 types of creative behaviour practised by children in their spare time. (Torrance Creative Leisure Interests Check-list.)
(4) A forced-choice questionnaire of preferred activities, pairing creative and non-creative items judged to be equally socially desirable. (Golann Creative Motivation Scale.)
(5) An imaginative composition. (An original story about "The Lion Who Couldn't Roar.")

(iii) *Procedure*

Teacher ratings: The 7A class teachers in each school were interviewed early in the first school term and asked to observe the class in preparation for rating creative performance at the beginning of third term. A list of the sort of behaviour to be rated, and of desirable but not creative behaviour to be ignored, was given to them. The concept "creative performance" was carefully discussed, questions answered and the purpose of the study explained.

Peer ratings: The instructions for peer ratings were as follows: "Please write down the names of the .... people (one-fifth of the total number in the class) in this class that you think have the best imaginations and think of the most clever new ideas for making and doing things. Imagine that this class has to produce something by itself, like a concert, or a magazine, or a class project of some kind. Who are the people who would do most towards it? Do not just write down the cleverest children, the ones who get the best marks, or the ones you like best, or the first ones you think of. Try to think about all the people in the class in turn, including some of the quiet ones you might not have thought about first time, before you make up your mind. You may put both boys and girls on your list. Are there any questions?"

Imaginative Composition: The instructions for the story task were: "Write a story called 'The Lion Who Couldn't Roar.' Do not worry too much about good spelling or good writing or anything like that. Just try to write an interesting story, one that other people will not think of. You can make up anything you like, and it can be as long or as short as you want to make it. Are there any questions?"

The story was judged by an independent marker with no knowledge of the children. It was given a global mark of 1, 2 or 3 for originality and also scored according to an objective scoring system devised by Maddi (1962).

The presence or absence of six categories of plot and character treatment considered to be unusual or infrequent are scored as 1 or 0 respectively. The three categories dealing with character treatment are 'unusual role designation,' 'introduced character,' and 'naming.' The three categories dealing with plot treatment are 'novel or unusual event,' 'novel interpretation' and 'unexpected ending.'

Testing: The testing was carried out during first term in two sessions six weeks apart. The tests were given by the same person at the same time of the morning in the same order in all schools.

An attempt was made, following the Wallach-Kogan (1965) recommendation, to make the testing situation as relaxed and permissive as possible. The time limit for the Torrance tests was increased to 12 minutes by which time a pilot study had shown that response production by most students had ceased.

III.—RESULTS.

Test-retest reliability. Parallel forms of both the non-verbal (squares and circles) and verbal (brick uses and tin can uses) tests were given with a six-week interval. Product moment correlation coefficients between scores gained on the two occasions are shown for the different schools in Table 1.

TABLE 1

TEST-RETEST RELIABILITY COEFFICIENTS FOR VERBAL AND NON-VERBAL TESTS OF FLUENCY AND ORIGINALITY AFTER A SIX-WEEK INTERVAL.

School	N	Non-verbal		Verbal	
		Fluency	Originality	Fluency	Originality
1	36	·545	·376	·402	·129
2	47	·650	·574	·478	·370
3	31	·781	·545	·236	·391
4	34	·846	·734	·728	·595
5	35	·634	·297	·372	·057
6	39	·704	·616	·474	·146
7	40	·685	·708	·614	·456
8	56	·571	·453	·659	·665
9	35	·778	·711	·550	·441
10	41	·664	·374	·409	·342
Average*	....	·688	·544	·515	·390

* NOTE: The average values of r were calculated from Z transformations of the correlation coefficients shown in the tables.

The reliabilities were higher for the non-verbal tests than the verbal in nine of the 10 schools. For nine of the 10 schools non-verbal fluency scores were more reliable than non-verbal originality, and for eight verbal fluency more reliable than verbal originality.

Intercorrelations between creative performance measures.

No assumptions were made in the design of the study about the magnitude of the correlations between the five measures of creative performance. It is clear that an individual may be creative in one sphere but not in another, creative at home but not at school, and so on. It is likely, however, that measures involving creative behaviour in the classroom (teacher ratings, peer ratings and imaginative writing) will be related to each other, as will the two measures concerned with creative leisure interests. Correlations between the two questionnaires, imaginative writing, and peer ratings are given in Table 2.

To simplify and shorten their task, teachers were not asked to rate the whole class but only to select the most creative 20 per cent. Only categorical information is therefore available for teacher ratings, and contingency coefficients for these are given separately in Table 3.

TABLE 2

CORRELATIONS BETWEEN FOUR DIFFERENT MEASURES OF CREATIVE PERFORMANCE

School	N	Imaginative Writing, etc.			Torrance Check-List, etc.		Golann Quest., etc.
		Torrance Check List	Golann Question-naire	Peer Rating	Golann Question-naire	Peer Rating	Peer Rating
1	36	·222	·058	·263	·256	·193	—·152
2	47	·331*	·364**	·115	·277*	—·101	·221
3	31	·204	—·067	·394	·274	—·015	·068
4	34	·200	·316*	·025	·360*	·479**	·492**
5	35	·434**	·219	·149	·229	—·081	·041
6	39	·132	—·202	·239	·181	—·075	·229
7	40	·263	287*	·282*	·119	—·104	·175
8	56	—·082	·104	·063	·401**	·422**	·339**
9	35	·309*	·093	·204	·470**	·054	·223
10	41	·240	·236	·069	·315*	—·253	·188
Average . . .		·237	·150	·174	·352	·067	·196

* p< ·05. **p< ·01.

TABLE 3

CORRELATION EXPRESSED BY CONTINGENCY COEFFICIENTS BETWEEN TEACHER RATINGS AND THE FOUR OTHER MEASURES OF CREATIVE PERFORMANCE.

Teacher Ratings, etc.	χ^2	c
Peer Ratings	81·485**	·41
Imaginative Writing	11·615**	·17
Torrance Check List	5·750**	·12
Golann Questionnaire	2·911	·08

** p< ·01

The two questionnaire measures, concerned with leisure activities are related to each other in the expected direction. Their intercorrelations are all positive, and significant in five of the 10 schools (one-tailed test).

The measures of in-school behaviour are also related. Teacher ratings are highly correlated with peer ratings, and significantly but not so highly related to imaginative writing. All the correlations between peer ratings and imaginative writing are positive, but significantly so in only one school.

Imaginative writing seems to be related to some extent to leisure activities. Correlations were positive with both questionnaires in most cases, and significant or highly significant for each questionnaire in three of the 10 schools.

It is interesting to note that the peer ratings for creativity were extremely consistent. In all 10 schools a small group of children received almost all the votes, whereas the votes for popularity (included as a check) were spread more evenly over most of the class. Table 4 lists the means and standard deviations for both creativity and popularity ratings, showing the larger variance in all cases for creativity.

TABLE 4

MEANS AND STANDARD DEVIATIONS OF CREATIVITY AND POPULARITY RATINGS.

School	N	Creativity		Popularity	
		Mean	s.d.	Mean	s.d.
1	36	5·471	7·281	5·882	4·418
2	47	5·894	7·716	5·915	3·864
3	31	5·000	6·456	4·968	2·469
4	34	5·333	7·412	5·182	3·796
5	35	6·794	6·206	6·059	3·143
6	39	5·225	6·122	5·275	2·915
7	40	5·725	7·972	5·725	3·339
8	56	5·860	9·257	5·860	2·812
9	35	5·686	5·605	5·771	3·304
10	41	5·780	9·398	5·732	2·905

Relationships between ability and performance.

(*a*) *Creative performance and creative ability:* The top 20 per cent of children on the total creative-thinking test scores were matched to a control group for sex, school, and IQ. Table 5 shows the number of children in the high creative-thinking group and in the control group who were in the top 20 per cent for no performance measures (low performance group), for one performance measure only (medium performance group), or for two, three, four or five performance measures (high performance group).

TABLE 5

THE NUMBER OF CHILDREN IN THE HIGH CREATIVE ABILITY GROUP AND THE CONTROL GROUP CLASSIFIED AS HIGH, MEDIUM AND LOW CREATIVE PERFORMERS.

	High Performance	Medium Performance	Low Performance
High creative ability	40	21	19
Control Group	11	20	46

$\chi^2 = 28{\cdot}476$ on 2 df.
$c = {\cdot}392$.

NOTE.—Three creative children were not available for further study and therefore controls were not matched to them. For this reason the control group (N=77) is smaller by three than the experimental group (N=80).

It can be seen that there is a highly significant relationship between creative thinking ability as measured by the tests and creative performance. (X^2=28·476 p< ·001, C=0·392). The tetrachoric correlation, $r_{t,}$ is 0·59.

(*b*) *Creative performance and IQ.* Since most studies have reported small positive correlations between intelligence and creativity, varying with the nature of the creative task (McNemar, 1964), the possible influence of this variable was considered. The correlation between total creative thinking score and IQ in the whole sample (N=394) was 0·143 (p< ·05). (It should be noted that the practice of correlating an intelligence *quotient* with a total creativity score, which is followed by almost all investigators in the field, is a misleading one because the effect of age is removed in the first but not in the second. Since the subjects in this study all became 12 in 1965, this was not such an important factor as in studies where the age range was greater.)

The high creative thinking and control groups were matched for IQ, and the high, medium, and low performance groups drawn from them. The mean IQs for the different groups were:

High performance	115·6
Medium performance	114·2
Low performance	118·0

It is evident that high performers in this study were not more intelligent than the low performers, at least in terms of the particular intelligence test used, and the differences between the groups cannot be attributed to intelligence. This observation applies to overall performance; it is possible that intelligence may be more related to creativity in school than out of school, but over the whole range of performance measures no relationship was found.

(*c*) *Sex differences in creative ability and performance:* No marked sex differences with regard to either creative thinking or creative performance emerged in this study. There were exactly the same number of boys as girls (N=40) in the high creative thinking group. In this total group of 394, 215 were girls and 179 boys, so the boys did achieve a slightly greater proportion in the top 20 per cent. The top three scorers were all boys, but in the best 5 per cent there were 12 girls and eight boys. The different performance groups were comprised as follows:

High performance	20 boys	20 girls
Medium performance	11 boys	10 girls
Low performance	9 boys	10 girls

IV—CONCLUSIONS AND DISCUSSION.

Reliability.

The reliability coefficients in this study are similar in size to those reported by Wodtke (1964). He uses more subjects than the present study, which should produce greater reliability, but on the other hand his subjects were younger (Grades 2 to 5 for non-verbal tests, 4 and 5 for verbal), and there was a tendency for increased reliability with higher grades.

A point of difference from the present study was his finding that verbal reliability tended to be higher than non-verbal, although this was not consistent.

For example, for Grade 4 the total non-verbal reliability (0·61) was higher than the total verbal reliability (0·53), while for Grade 5 this was reversed. Total non-verbal r was 0·64, total verbal r, 0·73. By contrast, in all but one of the 10 West Australian schools, the non-verbal tests were consistently more reliable than the verbal.

It was also noted in the present study that fluency scores were consistently more reliable than originality. As fluency and originality are not treated separately in the Torrance method of scoring used by Wodtke, it is not possible to make a comparison here.

Validity.

The results clearly show a highly significant relationship between scores on the tests of creative thinking and creative performance in real-life situations.

The performance measures were completely independent of the test scores ; in no way could the teachers, the peer group, the marker of the imaginative stories, or the children themselves, who contributed to the measures of performance, possibly have had access to or been influenced by the test results.

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THE USE OF THE ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES ON BRITISH FOUR-YEAR-OLD CHILDREN: A NORMATIVE AND FACTORIAL STUDY

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SUMMARY. The Illinois Test of Psycholinguistic Abilities (ITPA) was administered to 100 4-year-old nursery school children. Although the sample is biased by the inclusion of a disproportionate number of middle-class children, the scores corresponded closely to those of the American standardisation sample of the same age. Discriminant function analysis indicated a strong relationship between ITPA performance and social class, particularly in the auditory-vocal channels. Reliability, estimated by internal consistency and standard error, was acceptably high. Examination of subtest intercorrelations by principal components analysis and Varimax rotation indicated that a general linguistic factor accounted for about 45 per cent of the variance. The significance of these findings is discussed in relation to the use of the ITPA for the construction of remedial programmes for handicapped children.

I.—INTRODUCTION.

THE purpose of the present paper is to present some normative data on the experimental edition of the Illinois Test of Psycholinguistic Abilities with a sample of 100 4-year-old British children. Their performance will first be compared with that of the American standardisation sample of the same age, the results of the British sample being further examined in relation to sex and social class differences. The reliabilities and standard errors of measurement of individual subtests will be considered for both samples. Finally, the factorial structure of the test will be investigated through analysis of subtest intercorrelations obtained from the British sample.

The original purpose of the test constructors of the ITPA was to develop an instrument that would delineate specific psycholinguistic abilities in children between 2 and 9 years of age. Such a test would obviously be welcomed by clinicians, offering as it does the attractive possibility of diagnostic profiles and remediation programmes. In furtherance of these aims, work on the ITPA has now been in progress for some 18 years, and the test has come to include a number of impressive and instructive features. Most outstanding of these has been the issue of an experimental edition of the test, standardised on a restricted sample (N=750) and designed to supply further evidence as to the validity of the procedure adopted.

The experimental edition of the test (McCarthy and Kirk, 1961) was based on a model of communication processes proposed by Osgood (1957). Basically, the model distinguishes between:

(*a*) channels of communication; e.g., auditory input from the tester, vocal output from the child;

(*b*) levels of organisation: e.g., meaningful-representational or automatic-sequential;

(*c*) psycholinguistic processes; e.g., decoding, encoding and association.

The test consists of the following nine subtests:

(1) *Auditory Decoding*: ability to answer 'yes' or 'no' to simple questions; e.g., 'do apples fly?'

(2) *Visual Decoding*: ability to identify a picture from a previously exposed model; e.g., the child is shown a picture of a table and asked to select 'one like it' on the following page.

(3) *Auditory-Vocal Association*: a verbal analogies test; 'I sit on a chair, I sleep on a—.'

(4) *Visual-Motor Association*: ability to relate visual symbols; child is asked to relate pictures of common objects, usually on the basis of common use.

(5) *Vocal Encoding*: ability to express ideas in words; child is asked to say all that he can about a series of common objects.

(6) *Motor Encoding*: ability to express ideas in gestures; child is shown objects and pictures and asked to perform the appropriate gestures; e.g., hammer, gun, guitar.

(7) *Auditory-Vocal Automatic*: a test of the subject's ability to use morphological aspects of grammar such as regular and irregular plurals, comparatives, superlatives, past tense; e.g., 'this stick is long; this stick is even—'; this mother is writing a letter; this is the letter that she—.'

(8) *Auditory-Vocal Sequential*: a modified digit repetition test.

(9) *Visual-Motor Sequential*: ability to reproduce a series of visual stimuli from memory.

Full descriptions of the test, its underlying rationale and its statistical characteristics are available in a number of publications (McCarthy and Kirk, 1961; McCarthy and Kirk, 1963; McCarthy and Olson, 1964), and summaries of studies using the test have been brought together by Bateman (1965). The test has been criticised on a number of grounds; for example, Rosenberg (1969) has forcibly argued that it is not based on a viable model of linguistic competence and performance, and does not reflect recent work in developmental psycholinguistics (e.g., Smith and Miller, 1966; Lyons and Wales, 1966). Moreover, Osgood (1968) has himself moved away from his original model towards one more heavily influenced by transformational grammar. The test has also been criticised from a more psychometric point of view for defects of standardisation, reliability and validity (Weener *et al.*, 1967).

Although a revised version of the test is now available (Kirk *et al.*, 1968), it is likely that, for a variety of reasons, the experimental edition will continue to be used in Britain for some time. It is surprising, therefore, that only one British study reporting findings with the experimental version has been published so far (Phillips, 1968). The need for a British standardisation, or at least for normative data on a sample of British children, has been stressed by Phillips, particularly in view of the small number of children used in the USA standardisation sample (25 boys and 25 girls at each six-month interval).

II.—THE STUDY.

The present study is part of a wider investigation of language development in 4-year-old twins and singletons (Mittler, 1969). This report will be concerned only with the normal singletons who acted as control subjects for the twin studies. Age was the only selection criterion employed, care being taken to ensure that all the children were tested within four weeks of their fourth birthdays. The registers of eight nursery schools in Reading, Berkshire, were examined and a list drawn up of all children who would be reaching their fourth birthdays during the year of the study (1967). 50 boys and 50 girls were tested, though some of the children did not complete all the subtests. No child was excluded from the study on account of intellectual or linguistic defects.

Although the subjects were selected only by date of birth, the sample cannot be considered representative of normal 4-year-old children. As in most studies of nursery school children, a serious social class bias complicates interpretation of normative data. According to the Plowden report (Central Advisory Council, 1967), about 7 per cent of the under-five population is receiving some form of pre-school education, either within the state or the private sector. The present sample showed a strong bias towards middle-class children, as shown in Table 1.

TABLE 1

SOCIAL CLASS COMPOSITION.

Social Class	I	II	III	IV	V
Found N	13	33	26	12	13
Expected N	3	14	51	16	13
Percentage in general population ..	3·23	14·41	52·94	16·18	13·24

It is apparent that just under half the group come from the Registrar-General's Social Classes I and II (46 out of 97) as against an expected 17 in the general population ($chi^2=47·78$, $p=0·001$). However, the disproportionate number of middle-class children seems to have biased the sample at the expense of the intermediate Social Class III which is under-represented with only 26 instead of the expected 51 children ($chi^2=11·77$, $p=0·001$) ; on the other hand, the sample contains the expected proportion of children from Social Classes IV and V (25 out of 29).

III.—RESULTS.

Comparison of British with American children.

Results will be mainly discussed in terms of raw scores, since the subjects were highly homogeneous in respect of age, but comparisons between groups can also be illustrated graphically by a profile comparison involving standard scores.

Table 2 summarises the means and standard deviations of the American and British samples. It is apparent that the two groups are almost indistinguishable, and that the scores of the British children correspond very closely to those of the standardisation sample in Decatur, Illinois. Out of 30 comparisons, only two show a significant difference (motor encoding).

It would be rash to conclude from this finding that the ITPA can be confidently used in Great Britain, despite the socio-cultural and (perhaps subtle) linguistic differences between the two populations. In the first place, the present finding is based only on one highly homogeneous age group, and would not necessarily apply to older children. Secondly, the middle-class bias in our group might be masking a real difference between the two samples, though no data are available to support such a hypothesis. The American sample was also slightly biased by a disproportionate number of middle-class children, but this bias was more marked in the British children.

TABLE 2

ITPA Raw Scores of American Standardisation and British Samples (age 48 months).

	Decoding		Association		Encoding		Autom-Sequential			Total
	Aud 1	Vis 2	Aud-Voc 3	Vis-Mot 4	Vocal 5	Motor 6	Aud-Voc 7	Aud-Voc 8	Vis-Mot 9	
US Norms (N=50)										
Mean ..	12·06	7·22	8·82	9·80	9·36	9·54	5·64	12·52	5·84	80·80
SD	4·48	4·13	3·15	3·30	3·76	4·26	2·94	4·45	3·48	21·65
UK Norms (N=100)										
Mean ..	13·28	7·08	9·64	9·32	8·85	*7·86	6·53	13·22	4·78	80·14
SD	5·39	2·51	4·36	2·78	3·40	3·08	3·58	4·82	3·19	23·55
US Boys (N=25)										
Mean ..	11·48	7·56	8·36	8·92	9·00	10·04	5·44	12·48	5·52	78·80
SD	4·57	4·17	2·88	3·63	3·37	4·92	2·33	4·82	3·32	20·33
UK Boys (N=50)										
Mean ..	12·36	7·58	9·96	8·69	8·88	8·48	6·49	12·39	5·29	78·44
SD	6·34	2·85	4·67	2·36	3·68	3·50	3·89	5·57	2·74	27·05
US Girls (N=25)										
Mean ..	12·64	6·88	9·28	10·68	9·72	9·04	5·84	12·56	6·16	82·80
SD	4·51	4·23	3·46	2·81	4·23	3·61	3·54	4·23	3·75	23·50
UK Girls (N=50)										
Mean ..	14·09	6·68	9·94	10·29	9·06	*7·36	6·67	14·19	5·66	82·34
SD ..	4·84	2·10	3·47	2·68	3·38	2·40	2·90	3·85	2·97	19·18

* $p=0·05$.
All other differences non-significant.

Social Class.

The effect of social class on test scores was found to be highly significant on discriminant function analysis (Nunnally, 1967). Results are shown in Table 3, which summarises the subtest and total ITPA scores for three social class groupings (I+II, III, IV+V).

TABLE 3

Means and Standard Deviations of ITPA Raw Scores by Social Class

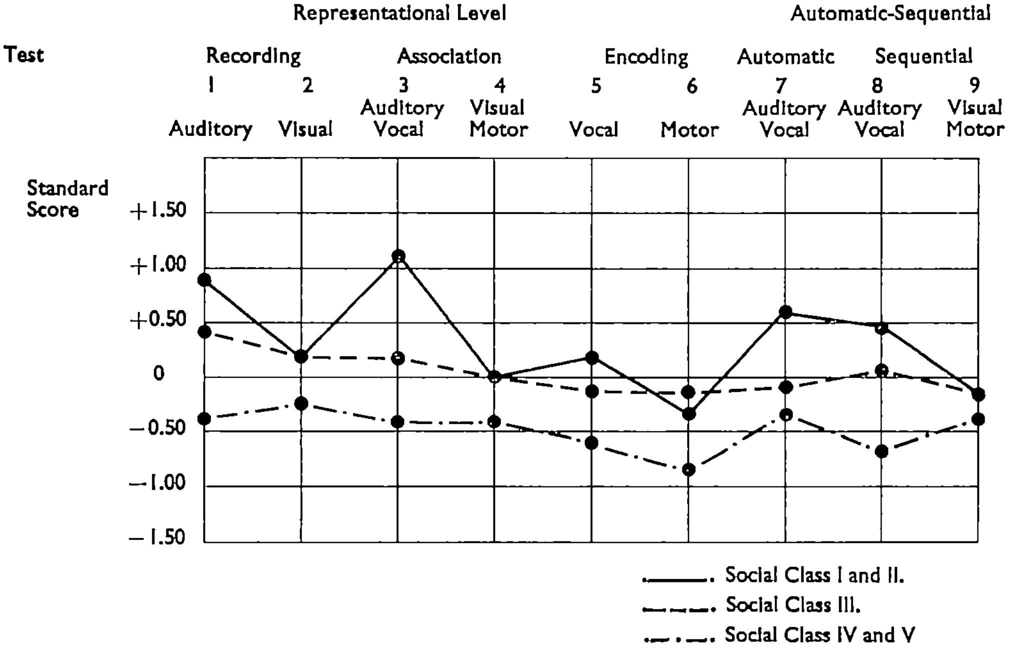
	SC I+II	N=46	SCIII	N=26	SCIV+V	N=25
1 Aud. Decoding	16·00	4·17	13·76	3·71	10·00	5·25
2 Vis. Decoding	7·66	2·29	7·76	2·63	6·24	2·40
3 Aud.-Voc. Assn.	12·05	3·40	9·52	3·75	6·52	3·93
4 Vis.-Mot. Assn.	9·76	2·67	9·96	2·13	7·57	2·80
5 Voc. Encoding	9·82	2·83	8·72	3·52	7·00	3·02
6 Mot. Encoding	8·45	3·18	8·68	3·24	6·43	1·91
7 Aud.-Voc. Autom.	8·24	3·50	5·76	2·93	4·62	2·20
8 Aud.-Voc. Sequ.	15·44	3·92	12·76	3·82	10·33	5·66
9 Vis.-Mot. Sequ.	5·34	3·13	4·76	2·99	4·48	3·30
10 ITPA Total	93·76	16·58	80·08	19·45	61·57	20·11

The discriminant function analysis is significant beyond a 0·001 level (eigenvalue=0·690, chi^2=40·16, df 11). The effect of social class on raw scores corresponds to a mean 'language age' ranging from 53 months for Social Classes I+II, to 41 months for Social Classes IV+V. Fuller details are available elsewhere (Mittler, 1969).

These results are also illustrated graphically in Figure 1, which expresses the data for each individual subtest in terms of standard scores derived from the original population.

FIGURE 1

MEAN ITPA STANDARD SCORES BY SOCIAL CLASS.



Consideration of the individual subtests suggests that the auditory-vocal channels are more affected by social class than the visual-motor channels. This finding, which is reflected in the correlations of each subtest with the canonical variate, is in line with the work of Teasdale and Katz (1968) in Australia, who have also reported larger social class differences on the five subtests involving auditory-vocal channels than on three of the four visual-motor channels. Similar conclusions were reached by Weaver and Weaver (1967) for culturally deprived negro children. In their original standardisation studies McCarthy and Kirk (1963) reported that the relationship of social class to ITPA scores was generally insignificant until after the age of six, but the present study reflects a strong positive relationship as early as 48 months; this invites the speculation that social class differences affect language development at an earlier age in Britain than in the USA.

Sex differences.

Table 4 summarises the sex differences in the present sample. It will be apparent that these are largely insignificant; although girls show a clear tendency towards higher language scores, the difference only reaches significance on the visual-motor association test. Significance levels approach the 0·05 level on the auditory-decoding and auditory-vocal sequential tests, and also (in favour of boys on this occasion) on the motor-encoding test.

TABLE 4

Sex Differences.

	Boys			Girls			p
	N	Mean	SD	N	Mean	SD	
1 Aud. Decoding ..	47	12·36	6·34	46	14·09	4·84	>0·05
2 Vis. Decoding ..	50	7·58	2·85	50	6·68	2·10	NS
3 Aud.-Voc. Assn.	48	9·96	4·67	48	9·94	3·47	NS
4 Vis.-Mot. Assn.	49	8·69	2·36	49	10·29	2·68	<0·01
5 Voc. Encoding ..	50	8·88	3·68	49	9·06	3·38	NS
6 Mot. Encoding ..	50	8·48	3·50	47	7·36	2·40	>0·05
7 Aud.-Voc. Autom	49	6·49	3·89	49	6·67	2·90	NS
8 Aud.-Voc. Sequ.	49	12·39	5·37	47	14·19	3·85	>0·05
9 Vis.-Mot. Sequ.	42	5·29	2·74	41	5·66	2·97	NS
10 ITPA Total	50	78·44	27·05	49	82·34	19·18	NS

Reliability and standard error of measurement.

In order to facilitate comparison with the original data, we followed the procedure described by McCarthy and Kirk (1963). This consisted of computing split-half reliability coefficients by the Rulon method, these then being used to calculate the standard errors of measurement for each subscale and for the whole test. The results of this analysis are set out in Table 5.

TABLE 5

Reliabilities and Standard Errors.

Test	Reliabilities*		Standard Errors†	
	English Sample	US Sample	English Sample	US Sample
Auditory Decoding	0·89	0·79	2·43	2·06
Visual Decoding	0·76	0·90	1·63	1·32
Auditory-Vocal Association	0·81	0·67	1·57	1·80
Visual-Motor Association	0·70	0·66	1·97	1·93
Vocal Encoding	0·70	0·69	2·18	2·10
Motor Encoding	0·52	0·86	2·83	1·61
Auditory-Vocal Automatic	0·96	0·89	1·04	0·98
Auditory-Vocal Sequential	0·89	0·72	1·96	2·36
Visual-Motor Sequential	0·89	0·84	1·43	1·39
ITPA Total	0·98	0·94	4·89	5·33

* Computed by " Rulon " method.
† Standard errors refer to raw scores.

It may be seen that the English and American samples have produced remarkably similar results both in terms of internal consistency measures of reliability and also of standard errors of measurement. The one exception is the motor encoding test, which may to some extent reflect sampling differences, since the English children, all of whom attended nursery schools, may have had rather more experience of this type of activity. Overall, the reliabilities of the subscales are acceptably high, while the reliability for the test as a whole is quite satisfactory for children as young as four years. This point was conceded by Weener *et al.* (1967) in an otherwise critical article. Even so, as they pointed out, the reliabilities of the subscales were too low for diagnostic and predictive work with individuals. This is confirmed by the standard errors derived from the present sample, where it may be seen that the considerable variability of the subscales suggests a need for caution in interpreting the educational significance of an individual's psycholinguistic profile. Moreover, it must be remembered that the test is widely used for children of below average ability who were deliberately excluded from the original standardisation sample, and who might be expected to produce scores near the floor of the test.

Intercorrelations of subtests.

Product moment correlations between each pair of subtests were computed, and are given in Table 6.

TABLE 6

INTERCORRELATIONS OF SUBTESTS.

	1	2	3	4	5	6	7	8	9
1 Auditory Decoding		339	672	454	327	534	623	443	445
2 Visual Decoding			393	215	442	163	323	116	269
3 Auditory-Vocal Association				448	301	477	715	578	481
4 Visual-Motor Association					221	330	366	390	296
5 Vocal Encoding						281	171	158	199
6 Motor Encoding							497	144	341
7 Auditory-Vocal Automatic								603	424
8 Auditory-Vocal Sequential									380
9 Visual-Motor Sequential									

Decimal points omitted ; all signs positive.

It will be apparent that a moderately high degree of covariance exists between many of the subtests ; all the coefficients have positive signs, only three are less than 0·2 and five exceed 0·5. In general, the matrix shows a higher degree of inter-relationships than that reported by McCarthy and Kirk (1963) on children of the same age. In their study, 14 of the correlation coefficients are less than 0·2, and two exceed 0·5: this again may be a reflection of the restricted range of intelligence in their sample.

Factor analysis.

With a view to obtaining further clarification of the correlation matrix in Table 6, the intercorrelations of the subscales were analysed by means of the principal components method. Unities were inserted in the diagonals, the number of factors extracted being limited to those with latent roots greater than unity. The resultant factors were then rotated to Varimax criterion. The results of these analyses are given in Table 7.

TABLE 7

RESULTS OF FACTOR ANALYSIS.

	PRINCIPAL COMPONENTS			VARIMAX ROTATION		
	Factor I	Factor II	Factor III	Factor I	Factor II	Factor III
1 Auditory Decoding	619	055	142	482	382	165
2 Visual Decoding	692	534	241	892	108	121
3 Auditory-Vocal Association	741	—498	059	154	835	284
4 Visual-Motor Association	620	—558	218	091	853	080
5 Vocal Encoding	765	—194	262	448	689	123
6 Motor Encoding	667	190	242	641	343	101
7 Auditory-Vocal Automatic	657	058	—610	244	172	848
8 Auditory-Vocal Sequential	652	039	—659	157	225	887
9 Visual-Motor Sequential	644	497	058	772	049	260
Latent Roots	4·097	1·174	1·066	2·352	2·257	1·727
Percentage variance	45·518	13·041	11·841	26·135	25·073	19·192

Decimal points omitted. Loadings positive unless otherwise stated.

The principal components analysis resulted in three factors of significance. Factor I is clearly the general linguistic factor identified by McCarthy and Kirk (1963), with moderately high loadings from all the subtests. Factor II is a weak bipolar, with tests from the visual channel contrasted against the two association tests. Factor III similarly contrasts the two encoding tests with two of the auditory-vocal tests.

Factors II and III seem to be somewhat different from the second and third factors reported by McCarthy and Kirk (1963) which, on the basis of moderate loadings, were named ' auditory-decoding ' and ' motor-encoding ' respectively.

It may be seen that the Varimax rotation results in three substantial factors, removing the bipolarity of Factors II and III. Factor I is much reduced in size and now picks up its highest loadings from two visual-motor tests, although decoding and encoding still figure prominently. Factor II might tentatively be considered an ' association ' factor, and thus confirms at least one aspect of the test model. Similarly, Factor III has high loadings from two of the auditory-vocal tests and is the best defined of the three factors.

The analysis, therefore, points to some mildly interesting relationships among the subtests, though it throws little light on the unidimensionality of subscales. The presence of a large general factor is confirmed, but very little of predictive value beyond this. Nevertheless, the reported use of factor analytic techniques in the construction of an individually administered test is something of a rarity, and is, therefore, worthy of further comment. McCarthy and Kirk (1963) do, in fact, quote extensively from results of factor analyses, both for the entire age range and for each age level separately, with a view to evaluating their success in constructing single ability tests. Their analysis extracted six factors at the four-year level, the last four containing only two loadings above a 0·5 level. They concede that they have taken certain liberties in naming these factors ; thus, factors with latent roots of rather less than unity are obviously represented, although once again the exact percentage variances are not quoted.

McCarthy and Kirk's use of the technique is criticised on technical grounds by Weener *et al.* (1967). Their principal objection is to the choice of diagonal entry ; they maintain that the insertion of unities introduces excessive error variance into the solution. The size of the latent roots of the extracted factors may, however, be a more important issue in the analysis of this type of data. A stringent analytic technique such as Varimax makes it possible to redistribute variance so as to give a false impression of the unidimensionality of subscales. Thus, by extracting all the common variance and then rotating the resultant factors to Varimax criterion, it is possible to produce a solution in which each subtest possesses maximal amounts of variance. Analyses such as those by Semmel and Mueller (1963) and Center (1963), which have been widely interpreted as confirming the uniqueness of ITPA subtests, may prove to be more significant as technical than as psychometric contributions.

A further approach to the problem of establishing factorially discrete subscales is provided by Silverstein (1967). He found that a single factor accounted for an average of 65 per cent of the variance at each of the age levels. From the subtest reliabilities he then obtained estimates of these specificities which represented about three-quarters of the communality. He invites the reader to speculate on the basis of this finding whether or not single factor scales have been constructed. A similar analysis, this time by channel, level and process, revealed no striking differences.

On the basis of the present results, and, indeed, of the test constructors' own findings, it is doubtful whether any useful factors other than a general linguistic factor are represented in the test content. Admittedly, the number of subjects, both in the American and British studies, is too small to justify definitive conclusions, but at least both samples do contain some degree of homogeneity which should assist in the production of separated factors (Guilford, 1967).

IV.—CONCLUSIONS.

The findings reported in the present study suggest that the performance of a sample of 100 English 4-year-old children is comparable—indeed, almost indistinguishable—from that of the American standardisation sample of the same age. Similar results were reported following the standardisation of the WISC in Scotland (Wechsler, 1965), though reports on the use of the 1960 revision of the Terman-Merrill Scale have been less consistent (Phillips and Bannon, 1968). As far as the ITPA is concerned, however, English and American children produced not only very similar raw scores on each of the subtests and on the test as a whole, but also showed almost identical reliability coefficients and a similar factorial structure. Nevertheless, we have no means of knowing whether the same results would be found in English children differing from the present sample in age and in social class.

The effect of social class membership has been shown to be very marked in the present study ; indeed, the effect of social class on ITPA scores is not only more marked than in American children, but is apparent at an earlier age ; McCarthy and Kirk (1963) reported that social class did not appear to affect ITPA scores before the age of 6, but a powerful effect can be observed in English children at 48 months. The effect is more marked in the auditory-vocal than in the visual-motor channel. This confirms the findings of a parallel study of 4-year-old twins, for whom the subjects in the present study acted as controls (Mittler, 1970). Comparison of intrapair correlations for identical and fraternal twins suggested that between 44 and 56 per cent of the variance of ITPA total scores was accounted for by genetic differences within the population ; however, the influence of genetic factors was relatively more marked in the visual-motor than in the auditory-vocal channels.

We would conclude that the advantages and disadvantages of the test are broadly similar for English and American children. The test represents a welcome and necessary attempt to produce a diagnostic instrument designed to delineate specific pyscholinguistic abilities. It helps teachers and educational psychologists to think less in terms of the global but non-specific construct known as 'language,' and more in terms of different aspects of linguistic functioning—particularly the distinction between comprehension and production (or decoding and encoding) and that between the different input and output channels involved in the communication process. The lack of a more differentiated factor structure is, of course, disappointing, but can scarcely be taken as a serious failure of test construction.

Despite these deficiencies, clinicians report favourably on the diagnostic use of the test (Bateman, 1965) and it is widely agreed that the test has considerable potential for ideographic investigation.

It is to be hoped that some of the deficiencies of the experimental version will be remedied in the revised edition which has recently become available in Britain (Kirk *et al.*, 1968 ; Paraskevopoulos and Kirk, 1969). Preliminary evaluation of this revised edition with English children has now been begun.

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VI.—APPENDIX.

SUGGESTIONS FOR RE-WORDING OF ITEMS FROM THE REVISED EDITION OF THE ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES FOR USE WITH BRITISH CHILDREN

BY P. MITTLER, J. WARD AND GRETAR MARINOSSON*

The recent publication of the revised edition of the Illinois Test of Psycholinguistic Abilities (Kirk *et al.*, 1968 ; Paraskevopoulos and Kirk, 1969) suggests the need for uniformity of item content among British users. The following suggestions are based on provisional studies on 50 normal 5-year-old Manchester children but no attempt has been made at this stage to attempt a restandardisation of the test. They are offered merely as modifications which might be suitable in Britain.

Auditory Reception

Item 16 : for *hatchets* read *axes*.
Item 19 : for *sidewalks* read *pavements*.

Visual Reception.

Demonstration : for *trash* read *rubbish*.

Auditory Association.

Example : for *turtle* read *tortoise*.
Item 12 : for *turtle* read *tortoise*.
Item 13 : for *pound* read *bang*.
Item 17 : for *block* read *brick*.
Item 21 : for *pickle* read *sausage*.
Item 29 : for *pants* read *trousers*.
Item 30 : credit *guards van*.
Item 42 : for *years have seasons, dollars have —* (quarters) read *years have seasons, hours have —*

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Visual Association.

Demonstration : for *baseball* read *ball.*

Grammatic Closure.

Items 13, 14, 24, 25 : for *cookie(s)* read *biscuit(s).*
Item 20 : for *blocks* read *bricks.*

No appropriate substitutions can be suggested for items in the Auditory Closure and Sound Blending tests.

Item 42 of the Auditory Association was finally chosen as the nearest equivalent to the original, since it embodies the principle of divisibility by four.

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THE DEVELOPMENT OF A CONCEPT OF VOLUME CONSERVATION IN ESN CHILDREN

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SUMMARY. This investigation showed that a concept of volume conservation can be taught to educationally subnormal children and that this understanding of conservation generalises to weight and substance situations. 104 ESN school children were pre-tested for conservation of substance, weight and volume. Then, using a varied teaching method which included three conservation of volume experiences, reasons, and situations, 30 of these children (non-conservers aged 9 to 15 with IQs between 46 and 75) were taught to recognise, generalise and give reasons for conservation. Post-testing after one and two weeks and again after five months revealed that their concept of conservation was durable as well as generalised. The teaching method used was found to be an effective way, though not necessarily the only or the best way, of developing conservation in children regardless of their prior understanding of conservation.

I.—INTRODUCTION.

A PREVIOUS investigation (Lister, 1969) found that, by using an eclectic method of individual tuition, it was possible to teach educationally subnormal children a durable concept of conservation of weight. The present investigation aimed to discover whether similar methods would be successful in teaching ESN children a concept of conservation of volume. The design of this investigation also threw light on the following additional issues :

(1) In the development of normal children, it is usually found that conservation is first exhibited in relation to substance, then to weight, and then to volume (see, e.g., Piaget and Inhelder (1941), Elkind (1961b)). The pre-testing procedures of the present investigation confirm that, with very few exceptions, this developmental sequence holds for the sample of 104 ESN children.

(2) Can a concept of conservation of volume be taught to children who, prior to training, do not exhibit conservation of either substance or weight? The answer seems to be that this can be done, and this raises the next question.

(3) If a child, who did not exhibit conservation of substance or weight, is successfully taught a concept of conservation of volume, then will the learned conservation concept generalise to substance and weight?

(4) Lastly, it has been found by Piaget *et al.* (1960) that children recognise conservation of interior volume prior to recognising conservation of occupied volume. The present investigation provides data on this particular developmental sequence.

In this investigation, a child was said to have an understanding of volume conservation if he recognised conservation in all the interior and displacement volume situations presented, whether or not he was able to measure and calculate volume mathematically. A child was said to understand conservation of interior volume if he recognised that the room inside a wooden unit-cube building remained unchanged during changes in the shape of the building as long as nothing was added or taken away. He was said to understand conservation of displacement volume if he recognised that the space taken up by metal unit-cubes and plasticine, and the water level likewise, would remain unchanged during transformations of the object immersed in water. The concept of volume conservation taught was strictly a concept of conservation and not a concept of volume which entailed mathematical calculation or an explanation of density. A full understanding of volume may require an understanding of density and the compression and decompression of matter (see Piaget and Inhelder, 1941, chapt. 8) as well as the mathematical calculation of volume; but such a concept of volume is distinct from, and not necessary for, the development of a concept of conservation in interior and displacement volume situations. It is this latter concept that is important for educationally subnormal children to learn since the recognition of volume conservation, though a limited aspect of an understanding of volume, is basic to any further and fuller understanding.

Several investigations have been carried out on the natural development of a concept of volume conservation (e.g., Beard, 1962; Elkind, 1961a; Lovell and Ogilvie, 1961; Lunzer, 1960) but, as far as the writer knows, no attempts have been made to teach volume conservation.

II.—PROCEDURE AND RESULTS.

104 educationally subnormal school children aged between 8 and 16 with IQs between 46 and 80 were pre-tested for conservation in Piaget-type substance, weight, and volume situations. 30 children who gave non-conservation judgments in *all* the volume situations were chosen for special teaching. 16 of these children, who failed to recognise conservation of substance and weight as well as volume, were paired—matched for chronological age and IQ; six other of these children, non-conservers of weight and volume, were likewise matched and the eight others, non-conservers of volume only, were so paired. Between experimental and control subjects, age differences were always less than nine months, and IQ differences usually less than six points. The 30 children selected ranged in age from 9 to 15 and in IQ from 46 to 75. The 15 experimental group children were taught and then post-tested twice. When the experimental group were given the post-test for the second time, the 15 control group children were pre-tested a second time; then they too were taught and post-tested twice. Five months later, 29 children were again post-tested.

The materials used were: plasticine, orange drink, four 100ml. beakers, one low wide dish, two 50ml. beakers, four 25ml. beakers, balance scale, lead weights, rice, wooden 1cm. unit cubes, metal 1cm. unit cubes, four perspex containers 4″×4″×3″, water, marking pen, four boxes of the following internal dimensions: 6×3×2 high cms., 12×3×1 high cms., 6×3×2 high cms. in two parts, 6×3×2 high cms. in four parts, " Lego " cubes, perspex boxes 5″×3″×2″.

Throughout the investigation the situations and questions were presented so as not to bias the children's responses, and the experimenter tried to avoid giving any extraneous or inadvertent cues by gesture, expression, or tone of voice.

(i) *Pre-testing.*

For reasons given in the introduction, the pre-test included items on the conservation of substance and weight as well as volume. Piaget's conservation problems were presented (see Piaget, 1952; Piaget and Inhelder, 1941; Piaget *et al.*, 1960). Orange drink in beakers, as well as plasticine, was used in testing for conservation of substance. Differentially-weighted same-volume balls of plasticine and identically-weighted different-volume balls of plasticine were included in testing for weight conservation. And Piaget-type displacement as well as interior volume situations were presented in investigating conservation of volume. Discontinuous material, blocks, was used in both interior and displacement volume situations; continuous material, plasticine, was used in addition to discontinuous in the displacement volume situations. There were 21 items: six transformations were made referring to substance, followed by six transformations referring to weight, followed by nine transformations referring to volume. To ensure that children distinguished volume from weight from substance when answering the conservation questions and that they gave judgments for appropriate reasons, the pre-test situations as well as questions were clearly different for the different attributes, and, where possible, judgments on the basis of different attributes were made mutually exclusive.

Each child was pre-tested alone for about 20 minutes and sat opposite the experimenter at a small table in some fairly quiet place in the school. Throughout the pre-test the experimenter made all the transformations in full view of the child. After a child made a judgment, the experimenter made only non-committal remarks and in an unchallenging manner asked the child why he thought what he did. The child's performance on the pre-test was recorded on a standard form and, as far as possible, his exact comments were taken down. Children's explanations of their judgments were taken as evidence of conservation or non-conservation.

The criterion for total non-conservation was a failure to recognise equality in any attribute (substance, weight, or volume) after transformation in shape in *every* one of the 21 pre-test transformations, accompanied by a clear indication of which portion was considered greater or less and why the child thought so. The criterion for partial non-conservation was non-conservation in one or two of the three attribute situations, i.e., the failure to recognise equality after transformation in *every* situation involving any particular attribute or attributes but not all three attributes. Reasons for conservation judgments taken as evidence of genuine concepts of conservation included: the recognition of identity of material, amount, or weight, that nothing had been taken away or added, and the recognition of the possibility of reversing the transformation or of similarly transforming the as yet unchanged portion, or a clear statement that the portions were equal before and so must still be equal.

Of the 104 ESN children pre-tested: 39 were total non-conservers; one gave non-conservation answers in all but the liquid substance situations; seven were non-conservers of weight and volume but conservers of substance; 11 gave non-conservation answers in the volume situations only; one gave conservation answers for all but the interior volume situations and five of the six displacement volume transformations; one gave conservation answers for all but the weight and interior volume situations; one conserved for all but weight and solid substance; one conserved for all but interior volume and solid substance; five conserved for all but interior volume; one conserved for all but displacement volume; two conserved in later but not in earlier transformations of different materials; and 34 were total conservers. The lowest mental age among children who recognised conservation in *every* situation was 5 : 7 (CA 10). The highest mental age among children who *failed* to recognise conservation in *every* situation was 9 : 5 (CA 15).

Though not unexceptionable, the sequence conservation of substance-before-weight-before-volume held for ESN children. Only three out of the 104 children recognised conservation of an attribute later in the sequence but not conservation of a prior attribute.

While the pre-test revealed that for the majority of ESN children conservation develops in the generally agreed sequence substance-before-weight-before-volume, it did not reveal any sequence conservation-of-interior-before-displacement-volume as has been found by Piaget (Piaget *et al.*, 1960). Rather, seven children gave clear conservation answers in the displacement volume situations but gave clear non-conservation answers for interior volume. The pre-test was repeated with these seven children and they responded as before. It was clear that these seven children were aware of the distinction between interior and displacement volume questions and understood the questions as the experimenter intended them. In brief, their recognition of conservation of displacement volume and failure to recognise conservation of interior volume, was not due to practice in the pre-test situations nor to any individual momentary confusion or variability.

The displacement volume situations in this pre-test, however, were slightly different from those described by Piaget *et al.* (1960, especially pp. 358 and 375-6) in that: (*a*) the actual transformation was made and a comparison object was present in every case, so that the situations were consistent with those for conservation of substance, weight, interior volume, etc.; and (*b*) the objects were not immersed in the water at the time of transformation (in order to avoid prejudicing judgments with perceptual evidence). However, the objects had previously been in water, and the children clearly understood what was meant when questioned on the objects making the water level rise, taking up space. The displacement situations were otherwise similar to Piaget's, as were the interior volume situations. The question of differences in recognition of conservation in different displacement and interior volume situations was studied and clarified in a subsequent investigation.

(ii) *Experimental and Control Groups.*

The 15 experimental group children consisted of eight total non-conservers (whose respective ages and IQs were: 14:5, 57; 12:5, 66; 12:0, 60; 11:1, 46; 10:5, 67; 10:2, 62; 9:11, 70; 9:4, 73); three nonconservers of weight *and* volume (ages and IQs.: 14:7, 61; 14:7, 52; 11:10, 63); and four non-conservers of volume only (ages and IQs: 14:9, 64; 14:5, 74; 13:2, 72; 10:8, 70).

The 15 control group children consisted of eight total non-conservers (ages and IQs: 14:5, 58; 12:10, 64; 12:2, 61; 11:10, 52; 10:4, 71; 10:1, 61; 10:4, 66; 9:5, 70); three non-conservers of weight *and* volume (ages and IQs: 15:3, 75; 14:2, 55; 12:0, 65); and four non-conservers of volume only (ages and IQs: 14:8, 70; 14:4, 70; 12:11, 74; 10:8, 71). There were eight boys in the experimental group and six in the control group.

(iii) *Teaching the Experimental Group.*

The 15 experimental group children were given teaching designed to develop a concept of volume conservation. Strictly *conservation* of volume was taught; physical, not mathematical, volume was considered. Conservation in Piaget's interior volume situation was taught first and then conservation in the displacement situation. The displacement situation, while it involves not only conservation and equivalence of volume but also recognition of the relation between volume of object immersed and volume of liquid displaced, enables simple recording of occupied volume in a finite situation, i.e., the water level can be marked off before and after an object is immersed or transformed, the object thus taking up room in a container of water rather than in unbounded space.

Each child was individually taught for one session of approximately 30 minutes. Although the method of teaching was flexibly adapted to the individual child, it was kept within standard limits and included set experiences and explanations. Each teaching session was begun with a repetition of the pre-test situations. Then the child was given varied experiences involving different manipulations of concrete materials in different situations and verbalisation of several reasons and empirical findings. The teaching included a combination of manipulating reversibility, filling containers with and counting discontinuous material, measuring displacement and verbalising reasons for conservation (including reversibility, identity, and compensation) and empirical findings (such as the distinction between appearance and reality, and the results of measurement). (See appendix for an outline of the teaching procedure.)

(iv) *Post-testing.*

The first post-test was given to each child one week after the teaching session, and the second post-test one week after that. Each child was seen alone for about 20 minutes. The standard post-test procedure was similar to the pre-test but included some new situations to test whether a general concept had been developed rather than a specific response learned; new as well as familiar materials, transformations, and names of objects were used. Questions demanding *inequality* judgments were also included; this was done to reveal whether there was, for reasons other than that of a genuine concept of conservation, any agreement to sameness after transformation. Unequal quantities were presented not only to check that recognition of sameness was not a response to any and every situation but also to test for further generalisation; children were required to give not only simple judgments of inequality but also judgments of conservation of inequality of volume. Throughout the post-test, the children were asked to give reasons for their judgments; both judgments and reasons were recorded. The stability of the children's conservation judgments was tested by the experimenter pointing out perceptual differences; in giving a counter-suggestion, the experimenter simply emphasised appearances and did not mislead the children.

On their first and second post-tests all 15 experimental group children made conservation of volume judgments throughout; the children gave conservation judgments on the familiar, unfamiliar and inequality transformations. The reason most frequently given for conservation was that of identity in the sense of its being the same material or same amount of material still, a reason quickly put into words by the children. Another reason frequently mentioned was that of reversibility in the sense of putting the material back the same as it was before. Compensation reasons were also mentioned but less frequently. The fact that nothing had been added or taken away was never given as a reason for conservation judgments although this reason too had been pointed out in the teaching. Individual children gave similar reasons on their first and second post-tests; each child's identity or reversibility or compensation reasons were just as clearly and fully expressed on the second as on the first post-test.

All 15 children now recognised conservation in substance and weight as well as volume situations. The eight children who had been total non-conservers generalised their taught concept of conservation and recognised conservation in the weight and substance as well as volume situations; seven gave clear reasons for their judgments. The three partial non-conservers, who had not recognised conservation of weight or volume but had recognised conservation in the substance situations, also generalised their taught concept of conservation and recognised conservation in the weight as well as volume situations; all three gave reasons for their judgments. These children understood and considered the different attributes in question, i.e., the children gave conservation judgments for the appropriate attribute in each situation. One girl, for example, before giving judgment asked: " Weigh you said, not space? "

More than a simple single verbal response was learned. Although the children's reasons could be categorised as identity or reversibility or compensation, there were noticeable differences in the way the reasons were expressed. Identity-type reasons were worded in different ways, e.g., " it's still the same toy or building " and not just " it's the same blocks or plasticine or amount "; reversibility-type reasons were likewise expressed in different ways, e.g., " you could move the other one the same " and not just " you could make it back the same as before." Compensation was also explained in different ways appropriate to the different transformations. Several children chose to demonstrate their reasons, e.g., one boy enacted reversibility throughout the post-tests.

On the repeat pre-test, given to the control group when the experimental group chidren did their second post-test, all 15 control group children still consistently gave non-conservation judgments.

(v) *Teaching and Post-testing the Control Group.*

The 15 control group children were then taught and post-tested in exactly the same way as the experimental group children had been. On their first and second post-tests, all 15 gave conservation of volume judgments throughout; the children made conservation judgments on the familiar, unfamiliar and inequality transformations. For their conservation judgments, the reason most frequently given by the control group children, as by the experimental group children, was identity, in the sense of its being the same material or same amount of material. Reversibility, in the sense of putting the material back the same as it was before, was, again, the next most frequently given reason for conservation. Compensation reasons were given by only one child. One other child mentioned the fact that nothing had been added or taken away in explanation of his conservation judgments; this reason, a version of the identity reason, had not been cited by any child in the experimental group. The reasons each child gave on his two post-tests were similar. As in the experimental group, all 15 control group children now recognised conservation in substance and weight as well as volume situations; the eight children who had been total non-conservers generalised their taught concept of conservation as did the three children who had been partial non-conservers. In brief, the controls behaved just as the experimental group children had.

Again there was evidence that more than a verbal response had been learned. Identity and reversibility reasons were worded differently by different children, several children enacted their reversibility reasons; compensation was expressed differently and appropriately for the different transformations.

(vi) *Post-testing with Revised Displacement Situations.*

The 30 children, experimentals and controls, who had been taught and post-tested were further tested, less than one month later, for conservation in revised displacement volume situations. This was to discover whether the taught concept would generalise to displacement volume situations more like Piaget's. The revised displacement volume situations differed from the original displacement volume situations in that (*a*) no actual transformation was made and no comparison object was present, (*b*) the object was immersed in water and the children asked where the water would come to if an object were transformed rather than asked if the water would rise equally far. The procedure otherwise was similar to that of the prior post-tests.

All 30 children generalised and recognised conservation in these revised situations and gave reasons similar to the reasons they had given on the first and second post-tests. Thus, their understanding of displacement volume conservation was not limited to the original situations only.

(vii) *Retention Study.*

In the retention study, carried out five months later, the 29 children still at the school were again given the post-test for volume, weight, and substance conservation. The revised as well as the original displacement volume situations were presented but, this time, within a single testing session. The testing was carried out under the same conditions and exactly as it had been before.

The durability of the concept of conservation developed in the children was evidenced by the fact that all 29 children still recognised conservation in every situation presented, and gave appropriate reasons for their conservation judgments. The most frequently given reason for conservation was, as before, identity in the sense of its being the same material or amount of material. Reversibility reasons were, again, next most frequently given. Compensation reasons and the fact that nothing had been added or taken away were infrequently mentioned. The reasons each child gave were similar to those he or she had given on previous occasions.

III.—DISCUSSION.

This investigation answered the question whether and how it is possible to develop a general understanding of volume conservation in educationally subnormal children. All 30 ESN children taught with a method which included counting for identity, manipulating reversibility, measuring displacement and verbalising the three reasons of identity, reversibility and compensation, learned and recognised conservation in all the interior and displacement volume situations of the post-test. More than a verbal response was learned. The children gave conservation judgments in unfamiliar and inequality situations as well as in the familiar situations. They made negative as well as positive responses.

The reasons the children gave varied. Some children gave several reasons and some one reason only; some children demonstrated reversibility rather than putting their explanation into words. The different children who gave one reason only for their conservation judgments rarely expressed their reason in the same way as each other. For example, one child said " you just have to fix it up the same," another said " it counts up the same," another " it weighs the same," and another " when it was together it was the same." And finally, the children's conservation answers were given to questions worded quite differently; no simple verbal cue was given. Thus it can be said that a genuine understanding of conservation was developed in these children.

Furthermore, the concept of conservation developed was a concept of *volume* conservation and not just one of number or substance conservation. The children understood the questions were of interior or occupied *volume*, e.g., some children even asked " room in it to run about in? " or " space you said, not weight? " They recognised conservation in situations involving continuous material where conservation for number alone would not apply, and distinguished volume from weight and substance and gave appropriate responses in situations where judgments on the basis of the different attributes were made mutually exclusive.

The investigation likewise answered the question as to whether conservation of volume can be taught before conservation of weight and/or substance is recognised. Total non-conservers and partial non-conservers learned to recognise conservation of the attribute last in the generally accepted sequence, substance-before-weight-before-volume, before they had recognised conservation of attributes earlier in the sequence. Recognition of conservation of weight and substance was not found to be prerequisite for learning conservation of volume, but understanding of conservation of weight and substance may develop concurrently when conservation of volume is taught. On their post-tests the children, who recognised conservation in the volume situations, always also recognised conservation in the weight and substance situations; no child taught in this investigation recognised conservation of volume but not conservation of weight and substance. This was in accord with the pre-test finding that conservation of volume is rarely recognised when conservation of weight or substance is not and conservation of weight rarely recognised when conservation of substance is not.

A third question answered in this investigation was whether a taught concept of conservation would be generalised to different attributes and situations, i.e., generalised from the volume to the weight and/or substance situations. All of the 16 children who had previously been total non-conservers generalised and recognised conservation in the weight and substance as well as volume situations. Similarly, the six children who had previously been non-conservers of volume and weight generalised their taught concept of conservation from the volume to the weight situations. Thus, 22 children given full varied teaching generalised their understanding of conservation and gave reasons appropriate to the different attributes in question. Clearly, the taught concept of conservation was generalised from an attribute later in the generally accepted sequence, substance-before-weight-before-volume, to attributes earlier in the sequence, but the question arises as to whether such a taught concept would generalise forward as well as backward in the sequence, i.e., from an attribute situation where conservation is usually recognised earlier to an attribute situation where it is usually recognised later. The results of a prior investigation (Lister, 1969), in which weight conservation was taught, suggest that it would generalise to later attributes as well, but this is currently being tested by the writer under conditions more controlled than in the prior conservation of weight experiment.

A question raised in the present investigation and studied in detail in a subsequent investigation was the effect of the particular displacement volume situation on the recognition of conservation. On pre-testing and repeated pre-testing, five children made conservation judgments in displacement but not in interior volume situations. Thus it appeared that conservation of interior volume need not precede conservation of displacement volume. Where Piaget *et al.* (1960) found that conservation is sometimes recognised in interior volume situations but not in displacement volume situations this investigation revealed the reverse order. The particular displacement situations, however, were different. Therefore, in a subsequent investigation, the effect of differences in the presentation of the displacement volume problems on a child's recognition of conservation was studied. Some children were found who did not recognise conservation in the displacement volume situations more like Piaget's, i.e., the revised situations of the present investigation ; yet they did recognise conservation in displacement situations like the original ones of the present investigation.

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V.—APPENDIX : TEACHING PROCEDURE.

Interior Volume—wooden unit cubes.

Step 1. Two 6×3×2 high buildings one made 12×3×1 high.
E demonstrate and S manipulate reversibility.
E demonstrate and S count cubes filling 6×3×2 high and 12×3×1 high boxes.
E verbalise continuing equality of room inside, identity of material and amount, that nothing added or subtracted, possibility of reversibility, and compensation relationships (i.e., reasons for conservation).

Step 2. Two 6×3×2 high buildings one made into two overlapping parts.
Repeat Step 1 procedure but S verbalise as well as E.

Step 3. Two 6×3×2 high buildings one made into four overlapping parts.
Repeat as above.

Displacement Volume—metal unit cubes.

Step 1. Two 4×3×3 high constructions one made 6×6×1 high.
E demonstrate and S mark on container water level rise same for 4×3×3 high and 6×6×1 high constructions.
S count cubes in 4×3×3 high and 6×6×1 high constructions.
E verbalise continuing equality of space taken up and S verbalise result of measuring water level (i.e., empirical evidence of conservation)

Step 2. Two 4 × 3 × 3 high constructions one made into two overlapping parts.
Repeat Step 1 procedure but S verbalise fact of continuing equality as well as evidence for it.

Step 3. Two 4 × 3 × 3 high constructions one made into four overlapping parts.
Repeat as above.

Displacement Volume—plasticine.

Step 1. Two equal volume unequal weight plasticine balls one made into ring.
S manipulate reversibility.
S mark on container water level rise same for ball and ring.
S verbalise reasons for conservation and empirical evidence for conservation.

Step 2. Two equal volume unequal weight plasticine balls one cut into two pieces. Repeat Step 1.

Step 3. Two equal volume unequal weight plasticine balls one cut into four pieces.
Repeat as above.

* Detailed description of the pre-testing, teaching and post-testing can not be given due to limitations of space, but the importance of the particular presentation of the conservation problems is recognised and a full description of the pre- and post-test situations and procedure including the precise wording of the questions is available on request from the author.

RESEARCH NOTES

THE FACTOR STRUCTURE OF THE FROSTIG DEVELOPMENTAL TEST OF VISUAL PERCEPTION

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SUMMARY. In order to obtain evidence as to the factor structure of Frostig's Developmental Test of Visual Perception, a factor analysis was made of the intercorrelations of subtest scores from the standardisation sample. Four separate principal component analyses were carried out, one for each of the grade levels concerned. It was found that in three out of four cases a single general factor, identified as perceptual maturity, was the only factor of significance. The fourth analysis extracted two factors, the first being the general factor already referred to, and the second a bipolar reflecting differences in the test content. These results are discussed with reference to other factorial studies and to the claims made for the relative orthogonality of the subtests.

I.—INTRODUCTION.

The Frostig Developmental Test of Visual Perception (DTVP), Maslow *et al* (1964) is rapidly coming into extensive use in Britain, being administered for diagnosis of perceptual anomalies, as a basis for prescribing individual remedial teaching programmes and as a test of general perceptual maturity. Standardised on the age range 3–9 years, it contains five subtests involving respectively: eye-hand co-ordination, figure-ground perception, form constancy, position in space and spatial relationships. The scores for individual subtests are used separately and also summate to yield an overall perceptual quotient, it being claimed that although these 'abilities' are not the only ones concerned in visual perception, they are important parts of the process and particularly relevant to school performance. Furthermore, it is contended that the subtests assess relatively distinct functions and that analyses of the pattern of scores can be utilised to plan programmes in which the child's strengths are harnessed to new learning and his weaknesses made the focus of remedial training.

II.—THE PROBLEM.

Basically then, the constructors have attempted to provide a test profile in which differences between the various subscale scores may be taken as diagnostically significant. However, despite this ambitious aim, especially in view of the difficulties well known to be inherent in profile construction (McNemar, 1964), it does not appear that factor analytical techniques were used in either the selection of items or the evaluation of subscales. Thurstone's earlier work is quoted when describing the general rationale adopted, but readers interested in the factorial structure of the DTVP are referred to two studies carried out elsewhere: those of Corah and Powell (1963) and Sprague (1963). Unfortunately, neither of these supplies definitive information: Corah and Powell used a small heterogeneous sample (N=40) and included other variables, some non-psychometric, in the analysis; Sprague's sample was larger (N=111) but also included other variables. Neither study in fact supported the concept of a diagnostic profile, Corah and Powell in particular regarding the two important factors in their analysis as a 'g' and a factor corresponding to developmental changes in perception.

In view of the limitations of these samples, therefore, an obvious approach was to factor analyse the subtest intercorrelations supplied in the test handbook, and this procedure was adopted by Silverstein (1965) who carried out a principal component analysis of these data. Following Harman (1960), Silverstein apportioned the variance of each subtest to three sources: communality, specificity and error.

In order to arrive at an estimate of the specificities he used the reliability coefficients (split-half) given for pooled age levels in the test manual, recognising that the latter did not refer directly to the data being analysed. On the basis of this he concluded that although a statistical comparison of a test's communality and specificity is not possible the magnitudes of the latter tended to support the test rationale.

This was an interesting approach but evaluation is difficult owing to the presence of several technical problems. The most obvious of these is the fact that in reporting his communalities Silverstein does not state whether any restriction was placed on the size of the latent roots of the factors extracted. It is also important to note that the pooled data contain considerable age variability which would tend to increase the size of these coefficients, which were corrected by application of the Spearman-Brown formula. So that the probability is that Silverstein's estimate of the specific components in the variance is rather inflated.

III.—Aim.

In view of the above, therefore, the aim of this study was simple: to obtain information as to the factorial structure of the DTVP which would assist in evaluating its usefulness for the many purposes for which it is now administered.

IV.—Method.

The intercorrelations of subtests for grade levels Kindergarten, 1 2 and 3 given in the test manual (Maslow *et al, op. cit.*) were subjected to principal component analyses using the Manchester University Atlas Computer. This involved insertion of unities in the diagonals and a restriction of the factors extracted to those with latent roots greater than unity.

V.—Results.

The results of these four separate analyses are given in Table 1. It was not considered necessary to rotate the two factors obtained in the analysis of Grade 3 data.

TABLE 1

Results of Principal Component Analyses of Frostig's DTVP Carried Out on Intercorrelations of Subtest Scores for Each of Four Grade Levels.*
(Obtained from standardization data.)

Grade Level Sample Size	Kindergarten n=385	First Grade n=334	Second Grade n=381	Third Grade n=173	
Subtests	Factor 1	Factor 1	Factor 1	Factor 1	Factor 2
1. Eye-motor co-ordination	+·474	+·621	+·619	+·637	—·102
2. Figure-Ground	+·718	+·678	+·646	+·541	—·695
3. Form Constancy	+·693	+·694	+·678	+·674	—·203
4. Position in Space	+·726	+·704	+·696	+·663	+·330
5. Spatial Relations	+·738	+·707	+·650	+·563	+·638
Latent Roots	2·291	2·323	2·166	1·910	1·051
Percentage Variance	45·815	46·469	43·328	38·196	21·020

* Table 8, page 487.

VI.—DISCUSSION AND CONCLUSIONS.

These results are extremely interesting and significant in view of the rationale for the test's construction. It may be seen that in terms of factorial structure the claims for the relative orthogonality of the subtests are not justified. This confirms the findings of the analyses already mentioned in that the general factor takes up a moderately high proportion of variance and in the case of the first three grades is the only factor of significance. Factor 1, therefore, is probably of general perceptual maturity, with the strong affiliation or identity with ' g ' noted in other analyses (Corah and Powell, *op. cit.*, and Silverstein, *op. cit.*). The amount of common variance involved is rather low and it might be argued that by lowering the restriction on the latent root size it would have been possible to extract other important factors. However, it was felt that in a matrix of this size a reasonably stringent limit should be applied.

The analysis of the Third Grade data is a little more promising since two substantial factors were extracted. Factor 1 is clearly similar to that found at other age levels but the bipolar Factor 2 appears to represent difference in the test content. Here measures of what is conventionally accepted as ' k ' may be contrasted with tests involving discrimination and perceptual stability. However, the extent to which this dichotomy may be practically useful remains to be seen. Ayres (1965), for instance, found in his comprehensive study of perceptual/motor dysfunction that the Form Constancy and Spatial Relations subtests loaded on the same factor.

It is instructive to compare these results with those reported by Silverstein also using principal component analysis. This analysis produced three common factors at the Kindergarten level and two at each of the other grades, but the first factor is not described in detail. It is, however, stated that the first factors are the only ones of importance, averaging 84 per cent of the communality of the tests. Silverstein also analysed the Sprague and Corah and Powell data, finding that the first factor again accounted for most of the communality (over 75 per cent). In general, these findings appear to accord with those of the present study except over the size of Factor 2 at Grade 3. Silverstein's second factor presumably takes up 16 per cent of the variance which is less than the 21 per cent of Factor 2, but this is probably due to minor technical differences in the analyses.

The DTVP is one of a number of tests designed to be an advance over the more global methods of assessment represented by the Stanford-Binet and Wisc. Factorially speaking, however, it is somewhat disappointing for use on the general population of children and shows evidence of a lack of constructional refinement. It may well be that in the populations for which the test is primarily intended, the results produce factor structures more in keeping with the intentions of the authors and evidence as to this will no doubt be forthcoming. Certainly, as judged by the Ayres study, the test is a useful component in a test battery, although caution must be entertained if it or any of its subtests are used for reference purposes.

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THE CONCURRENT VALIDITY OF TWO TYPES OF SPELLING TEST

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Summary. Few tests of spelling attainment have been validated against the criterion of spelling accuracy in everyday writing, which, it is contended, is the prime objective of teaching spelling. An investigation is described comparing the spelling performance of 506 children (median age 11 : 6) in their written work and on dictated-word (recall) and multiple-choice (recognition) types of test. The dictated word test had a slightly higher concurrent validity, but other factors which should be taken into account in devising spelling tests are pointed out.

I.—Introduction.

A survey of the literature on spelling attainment tests shows that their validity has been more often assumed than demonstrated. The most common type, the dictated-word test, has usually been validated against a similar kind of measure, either spelling performance on dictation tests given as part of a regular teaching programme or performance on a dictated-sentence test. Other types of spelling test—for example, those using various kinds of multiple-choice, sentence completion, or skeletal word items—have in turn used dictated words or a dictated passage consisting of several sentences as the validating criterion. Thus Nisbet (1939), in a comparison of a dictated-word test with two non-dictated ones, used performance on a dictated passage as " a criterion assumed to be valid."

Test constructors commonly publish validity coefficients to demonstrate the extent to which their test measures what they say it is intended to measure. Obviously the usefulness of such coefficients hinges on the criterion used. In the case of spelling, the question should be asked : what is the performance in which we are really interested ? Is it (*a*) the child's ability to reproduce correctly a sample list of words which he has already been ' taught ' ; or (*b*) the child's ability to spell correctly the words he uses in his everyday writing ? If the answer is (*a*), then any spelling attainment test used must logically draw its sample of words from the spelling programme which the child has been following ; if (*b*), then the criterion measure should be some estimate of spelling performance taken from a sampling of children's ordinary written work, rather than the results of a dictation test (word or sentence).

In practice, the content validity of spelling attainment tests is rarely a satisfactory kind of indicator, because few of the standardized tests are constructed for use with specific teaching programmes. Curricular or ' face ' validity is most often estimated by checking against basic lists (e.g., Fitzgerald, 1951 ; Hildreth, 1955) of words most frequently used by children rather than against the particular teaching list which the test might sample. This can lead to situations such as that described by Hopkins and Wilkerson (1965), who found considerable differences between the extent to which various forms of the California Achievement Test sampled words which had been taught at each level : in other words, a child's assessment relative to that of other children—as well as his actual performance (number of words spelt correctly)—varied considerably according to the form of the test used.

It appears, therefore, that attempts to assess the content validity of standardized spelling tests can only be rough and ready, and will probably give misleading results unless the test is designed specifically for a particular teaching programme. Furthermore, one can question whether it is indeed even desirable that such tests be designed to measure performance in relation to a specific programme. When we refer to a child's spelling (or reading) attainment, it is rarely implied that this is restricted to his achievement in coping with particular instructional materials ; it is with his achievement in these areas in general that we are concerned. Contrariwise, in the case of school subjects in which the content selected by individual teachers may vary considerably, as in social studies for instance, there are strong but by no means conclusive arguments for ensuring that test items sample only the material taught (Cronbach, 1960, p. 104). This assumes, of course, that the objectives whose attainment one is attempting to evaluate are specific to that material. In the case of such pervasive achievements as reading, writing and spelling, however. it is doubtful whether the same conditions can or should apply.

Assuming that a teacher's ultimate objective is to get his pupils to spell accurately in their everyday writing, rather than just in set exercises, which type of test, either recall (e.g., dictated word) or recognition (e.g., multiple choice) will provide a quick and valid measure of spelling propensity? The term 'propensity' is used advisedly, as on the face of it, more than just spelling *ability* is involved: what is often referred to as 'spelling consciousness' (including proof-reading) and 'spelling conscience' will probably also contribute to performance. The investigation described below was therefore set up to test the hypothesis that recognition items would be more valid, using performance in ordinary written work as a criterion measure, than would a recall type of measure.

II.—METHOD.

(*a*) *Subjects.* These consisted of all Form I children (median age approximately 11 : 6) in two intermediate schools in a small provincial New Zealand city. Altogether, 276 boys and 230 girls were tested, and the sample was estimated, on the basis of similar investigations in the city in the past, to be a representative group in terms of distribution of intelligence and social class origins of the children.

(*b*) *Spelling tests.* For both types of test, items were used which had been subject to analysis as part of a reputable test battery. Thus reliability data were already available.

(i) The dictated word (recall type) test consisted of a list of 50 words forming a subtest of Form X, Grade 6 of the New South Wales Basic Skills Testing Programme (1964). Each word is dictated by the class teacher, repeated in context in a sentence, and then repeated again on its own. The reliability coefficient of this test has been found to be ·958 for parallel forms and ·953 by the split-half (corrected) method.

(ii) The multiple choice (recognition-type) test consisted of 46 items from Form 1, Grade 6 of the Iowa Test of Basic Skills (1955). In the sub-test, each item consists of four different words, all of which may be spelt correctly or no more than one of which may be incorrect. The testee is required to indicate which word (if any) is incorrectly spelt, or, if all are correct, to mark a fifth category 'no mistakes,' e.g., (1) thirteen; (2) remember; (3) obayed; (4) blood; (5) (No mistakes). The reliability of this test for Grade 6 pupils is cited by its authors as ·93 (split-half procedure).

(*c*) *Criterion measure.* There are obvious difficulties in assessing spelling competence in everyday writing, and this no doubt accounts for earlier investigators almost consistently avoiding it as a criterion against which to measure validity. This is in spite of the fact that most teachers would cite spelling accuracy in all written work as the primary objective of their teaching in this area.

In a pilot study an attempt was made to scale the spelling performance of a group of children from their class exercise books in three subject areas: English, social studies and nature study (elementary science). These books contained both original compositions and notes by the children, as well as notes compiled or copied either from books or from material supplied by the teacher. The number of variables involved, however, made such scaling difficult and of doubtful reliability.

In the present study it was decided to take a single sample of each pupil's written work, by requiring him to write a story within a specified time limit (30 minutes). The children were instructed to imagine that they were accompanying a school party on a tramping expedition and had become separated from the rest of the group. They were asked to make up a story describing what happened after they realised that they were lost. No reference was made to spelling or to the fact that an assessment of their spelling would be made, and access to spelling lists and ordinary dictionaries was permitted without comment.

The resulting samples of written work were first checked for the number of spelling errors in different words (apart from proper names), and for the total number of words written. The scripts were then assessed as above average, average, or below average on each of four relevant factors, namely (*a*) the total number of words written in 30 minutes; (*b*) the level of complexity of the vocabulary used; (*c*) the number of errors in different words; and (*d*) the types of error involved (i.e., whether idiosyncratic or showing at least some application of appropriate phonic rules). Criteria for factors (*a*) and (*c*) were objective, and for factors (*b*) and (*d*) largely subjective.

Following this, an overall assessment of each child's spelling competence was made by subjectively taking into account his rating on the four factors. No specific formula was used for this purpose, each script being re-assessed as a whole. The scripts were scaled by sorting them into 12 piles; no *a priori* restrictions were imposed on the distribution but, as was expected, there were fewer scripts in the top and bottom piles than in the middle ones. The reliability of this combination of analytic-impression methods of assessment was checked by having a sample of 229 scripts re-assessed by two experienced teachers, acting independently. Inter-judge reliability coefficients were ·85, ·86 and ·89.

III.—RESULTS.

Results obtained are shown in Table 1 (N=506).

TABLE 1

RESULTS OBTAINED FROM THE USE OF THREE DIFFERENT MEASURES OF SPELLING ABILITY.

	Mean	s.d.	Inter-Correlations	
(1) Written work (scale score)	7·19	3·15	r_{12}	·678
(2) Multiple-choice test	28·96	9·67	r_{13}	·717
(3) Dictated word test	24·38	13·72	r_{23}	·845

The dictated word (DW) test correlated slightly more highly with the criterion measure than did the multiple-choice (MC) test, the difference being significant ($t=2·29$; $p<·05$) on a t test for non-independent samples (McNemar, 1955, p. 148).

A further, more subjective, check on the efficacy of the two tests was made by asking the teachers in one school to examine all cases in which there was a difference of 10 or more centile ranks between the two test results for any pupil. In 80 cases (29 per cent.), individual teachers thought that the DW test rank was a more accurate reflection of the child's overall spelling ability, in 52 cases (19 per cent) that the MC test result was more accurate; in 145 cases (52 per cent) there was less than 10 centile ranks difference between the child's results on the two tests, and most lay around the median where the percentile units were, of course, relatively the smallest.

IV.—DISCUSSION.

Although the DW test had a slightly higher concurrent validity than the MC test, the difference in variance accounted for was not substantial (51 per cent as against 46 per cent). The inter-correlation of the two tests (·845) was in fact higher than the correlation of either of them with the criterion and it is obvious that they were measuring substantially the same ability, in contrast to the findings of Ahlstrom, cited by Peters (1967, p. 62). On the grounds of concurrent validity there was thus little to choose between the two types of test administered in this case, nor would sufficient additional variance be accounted for if one test were used to supplement the other. The difference between the validity coefficients did not appear to reflect specific content (word selection in each test) in relation to the criterion task.

Some of the disabilities of DW tests as standardized instruments have already been pointed out by Nisbet (1939) and others—for example, variations in administration caused by the tester's pronunciation, enunciation, rate of speaking and so on. To these deficiencies must be added the problems relating to content validity discussed above, which may lead, as Hopkins and Wilkerson found, to inconsistent (unreliable) results.

With reliability coefficients as high as those quoted for the DW test, furthermore, little would be gained by lengthening it; but it should be noted that the MC test 'covers' four times as many words in approximately the same administration period as the DW test requires. This would reduce the chances that a particular test might include a substantially larger proportion of ' taught ' words than an alternative test or form. On the other hand, the emphasis in MC tests on recognition rather than recall might adversely influence the teaching-learning procedures adopted in the classroom, as has occurred in other curriculum areas. Children's errors in both types of test can be used for diagnostic purposes : the MC items can be keyed more easily for this, but the DW test allows a wider range of potential sources of error.

To sum up : the results of this investigation offer some slight evidence favouring the DW type of spelling test construction on the grounds of better concurrent validity, but the difference is not sufficiently large to outweigh other factors such as content validity and consistency and ease of administration, which are far less readily assessed.

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FOOTNOTE TO THE SCOTTISH SURVEY OF INTELLIGENCE

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Summary. A major conclusion of the 1947 Scottish survey of intelligence was that there had been a gain since 1932 on the group test but no gain on the individual Stanford-Binet test. This conclusion is marred, however, by the use of regression methods of equating the 1916 and 1937 editions of the individual test for which only 89 cases were available. Avoidance of the sample of 89 cases who had been administered both editions of the individual test by the use of the equipercentile method of equation reveals parallel gains for both the group and the individual test. There is no need to qualify the conclusion that a small increase in intelligence among Scottish school children occurred between 1933 and 1947.

The results of the 1947 Scottish survey of intelligence (Scottish Council for Research in Education, 1949) were somewhat ambiguous, as reported, with respect to a gain in intelligence between 1932 and 1947. The group test, which was the principal survey instrument, showed a gain. The 1916 and 1937 editions of the Stanford-Binet were also administered in 1933 and 1947, respectively, to 500 or more students of each sex. When the two editions were equated, by a procedure which will be described briefly below, the authors reported a slight loss for girls. Overall the mean intelligence quotients were almost precisely the same. The conflict in results between the group test and the individual tests has sometimes been interpreted as meaning that ' real ' intelligence did not change.

The procedures used in equating the two versions of the individual test are, however, open to question. First, the authors used a regression method for equating group and individual test scores separately for the two sexes. Then they used a regression method for equating the scores on the separate individual tests. The equation of group to individual test involved 500 or more of the special cases for each sex, but the final equation of the two individual tests involved only 89 cases of both sexes combined.

A good case can be made against the regression method of equating scores on two tests each of which is supposedly measuring basically the same function. An even better case can be made for forgetting about the 89 cases who had been given both versions of the individual test and basing the equation of the two on their relationship to the group test. An N of 1,000 or more for this step in the procedure has clear advantages over an N of 89 but use of the large N requires the equipercentile method of conversion.

There are advantages to the use of the equipercentile method over and beyond its applicability to the data based upon the large N. It requires only ordinal scales of measurement and is thus independent of the shape of the regression. It is also independent of attenuation in the slope of the regression introduced by measurement error. It does require the assumption that the two measures are equally valid measures of the trait, but the regression method requires a different and at least equally difficult assumption that one of the two measures can be considered the criterion measure of the trait.

Table 1 contains comparable scores for boys and girls for each level of the group test on the 1916 and 1937 editions of the Stanford-Binet. Also included are the differences between the intelligence quotients for each level of the group test. When these differences are weighted by their respective Ns and averaged, it is seen that the mean difference in intelligence quotients for boys between the 1916 and 1937 editions is 3·14 units. The comparable figure for girls is —·99. There is clearly an interaction between sex and the two editions of the Stanford-Binet when the conversion is based upon the group test common to both testing periods. This same interaction is also seen in the results from the six-day sample in which girls are slightly superior to boys on the group test and significantly inferior to boys on the 1937 revision. For some reason, Scottish girls seemed to be at a relative disadvantage on the revised Stanford-Binet in spite of the near equality of the sexes in the standardisation samples. The latter were, of course, drawn entirely from the United States.

TABLE 1

EQUIVALENT SCORES ON THE 1916 AND 1937 EDITIONS OF THE STANFORD-BINET FOR VARIOUS LEVELS OF THE GROUP TEST.

Group Test	Boys			Girls		
	1937 ed.	1916 ed.	Diff.	1937 ed.	1916 ed.	Diff.
69·5	167·83	149·17	18·66	154·50	149·50	5·00
64·5	151·17	140·12	11·05	149·50	139·50	10·00
59·5	134·50	128·46	6·04	133·71	132·50	1·21
54·5	125·02	121·53	3·69	122·68	119·71	2·97
49·5	116·06	112·94	3·12	113·72	112·36	1·38
44·5	108·46	106·37	2·09	107·10	107·05	·05
39·5	103·96	100·48	3·48	99·27	100·01	—·74
34·5	100·11	95·33	4·78	94·01	94·21	—·20
29·5	95·77	90·88	4·89	88·43	90·22	—1·79
24·5	89·85	87·38	2·47	82·68	86·17	—3·49
19·5	85·96	85·26	·70	79·27	82·28	—3·01
14·5	82·09	81·57	·52	75·52	79·05	—3·53
9·5	77·71	77·71	·00	72·17	75·41	—3·24
4·5	73·79	71·64	2·15	67·23	70·05	—2·82
—·5	54·50	54·50	·00	49·50	64·50	—15·00
Weighted Mean Difference			3·14			—·99

There are two ways in which the equipercentile method can be applied. Equipercentile conversions can be computed between the group test and each individual test, and then the individual tests can be converted to each other. Alternatively, the published regression conversions of individual test on group test can be accepted, but an equipercentile conversion can be substituted for the published regression conversion between the two individual tests. The latter will be designated the 'mixed' method.

TABLE 2

SUMMARY OF RESULTS FOR 1932 AND 1947

	BOYS		GIRLS	
	1932	1947	1932	1947
(1) Group Test	34·503	35·880	34·409	37·622
Regression Conversions :				
(2) Individual or Group	99·86	103·68	98·56	100·75
(3) 1916 or 1937		100·48		97·89
Equipercentile Conversions :				
(4) Group to Individual	98·29	103·52	97·67	100·61
(5) 1937 to 1916		99·91		101·49
(6) 1916 to 1937	101·70		96·33	
Mixed Conversions* :				
(7) 1937 to 1916		100·54		101·74
(8) 1916 to 1937	103·00		97·57	

* Utilises the regression conversion of each individual test on the group test (line 2) as the first step, but uses an equipercentile conversion as the second step.

Table 2 presents the published data on group test and the regression conversions of the individual tests in the first three numbered rows. These data are followed by equipercentile conversions computed by the present writer. The means in lines 2 and 4 which represent different estimates of the population IQs on the individual tests are generally comparable though the equipercentile values are somewhat lower. This difference is a regression phenomenon, arising from the lack of perfect correlation between group and individual test. Conversions of 1916 IQs into 1937 IQs are contained in lines 3, 5 and 7. The two variations of the equipercentile method are in general agreement in showing a gain in IQ for girls, but both depart radically from the regression results. Furthermore, when the 1932 results are presented in the units of the 1937 revision of the Stanford-Binet (lines 6 and 8), the discrepancy between the results for the two sexes is very marked.

The weak conclusion that can be drawn from this analysis is that the previous outcome of no gain on an individual test of intelligence between 1932 and 1947 is questionable since a different and supportable methodology demonstrates a gain. The strong conclusion, which accepts the superiority of the equipercentile methodology for problems of this type, is that gains on group and individual tests are approximately parallel and that the gain was greater for girls than for boys. From the latter point of view there is no need to qualify the conclusion that a small increase in intelligence among Scottish school children occurred between 1932 and 1947. One is strongly tempted, furthermore, to predict that the gain would have been larger without the disrupting effects on education of World War II. Even so the results are well in line with Tuddenham's demonstration of an increase in intelligence among men in the United States between World War I and World War II (1948).

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THE RELATION BETWEEN MENTAL HEALTH, ACADEMIC PERFORMANCE AND COGNITIVE TEST SCORES AMONG CHEMISTRY STUDENTS

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SUMMARY. This study examines the relationship between cognitive test scores, psychological symptoms and academic outcome for undergraduate chemistry students at University College, London, between the years 1956-61. There was some association between a high level of academic success, stress, and a high score of Valentine's reasoning test. Low cognitive test scores and psychological disturbance, however, did not relate to wastage and failure in this group of students.

I.—INTRODUCTION.

Recent research on the mental health of students has highlighted the importance of psychological disturbances in relation to academic performance. It is clear that there are associations between such disturbances and the capacity to maintain academic study and that these are reflected in examination performance. These relations, however, are complex. In a previous study, Lucas *et al.* (1966) found a significantly higher prevalence of severe disturbance and lower intelligence in a group of less successful students than among the more successful. Nevertheless, severe disturbance was compatible with success at the highest level. Kelvin *et al.* (1965) noted a ***higher*** prevalence of the less severe disturbances amongst students who had obtained firsts than amongst those who obtained less good degrees. Ryle and Lunghi (1968) at the University of Sussex concluded that intellectual factors played a minor role in relation to academic difficulty, and that psychiatric and personality factors were of greater importance. These workers noted that in students who were failing academically there was a significantly low stress gain response on the Nufferno test in those who were clinically disturbed, in comparison with those who were not disturbed. They emphasise the importance of relating individual predisposition to external pressures in determining outcome. Since there are known to be large and complex differences not only between different institutions, but between different departments of the same institution in selection, teaching and examining procedures, in staff attitudes to and expectations about students, and in the demands of different kinds of subject, it is clear that these factors must limit the usefulness of tests in forecasting individual outcome, quite apart from the innate limitations of the tests themselves.

The present study attempts to explore the relationships between psychological disturbance, certain cognitive test scores and academic performance among chemistry undergraduates at University College, London.

II.—METHOD.

Psychometric data were collected on most of the undergraduate entry from 1956 to 1961, inclusive. The tests were completed prior to entry and were used as part of the selection procedure, together with A-level results, headmasters' reports and ratings by members of the Chemistry Department staff. The following tests were included:

(1) *General Selection Test.* Graph-1. This test was made up of items from Vernon's Graph test. No results of item analysis or standardisation have been published, but it has been used in the Universities of London, Reading and California and data suggest that it is able to discriminate among university students (Arnell, 1967).

(2) *AH5* (*Heim,* 1956). This is a closed, time-limited test of high grade intelligence divided into two parts; part one testing verbal and arithmetical reasoning and part two mainly non-verbal reasoning.

(3) *General classification.* A short non-verbal test of ability, particularly in regard to spatial relationships. (Unpublished and restricted.)

(4) *Valentine's reasoning test.* This test was specially devised to discriminate between highly intellectual subjects and all items are complex and require high reasoning power and a good deal of concentration (Valentine, 1961).

Tests and assessments were not uniform throughout the study. The AH5 and General classification were discontinued in 1959 and headmasters' ratings and interviewers' assessments were not available for 1957. No General Selection Test was used in 1958 and in 1957 General Selection Test 2 was used. Valentine's reasoning test, however, was included in the selection programme for each of the six years.

Clinical classification was made retrospectively, after the students had left college and without knowledge of either test scores or degree results. The records of those who had attended the health service were scrutinised (by E.M.J.) and the students placed in one of the following categories:

(1) 'Physical' attenders. Those who attended for treatment of a physical disorder recognisable as some disease entity, e.g., tonsillitis, acne vulgaris, etc., or for bodily symptoms without psychological complaints.

(2) 'Psychological' attenders. Grade 1. Those who reported clear psychological symptoms at some stage—for example, insomnia, anxiety, poor concentration and so forth—whose management consisted of brief advice and short-term medication. Grade 2. Those who were asked to attend for one or more appointments for discussion of symptoms and associated problems—usually on account of the severity

or the duration of their symptoms. Grade 3. Those who were referred to a psychiatric service outside the Student Health Service, either because hospitalisation was thought to be a possible requirement at some stage or because of the need for psychotherapy for long-term problems.

Academic performance was assessed by results in the final examination.

III.—RESULTS.

Of 284 students entering over the six-year period of the study, about 56 per cent went to the health centre, half of them primarily for psychological advice. This is not exceptional in relation to the general college population. The attendance rates by years are shown in Table 1.

TABLE 1

PROPORTIONS OF CHEMISTRY STUDENTS IN DIFFERENT HEALTH CATEGORIES ATTENDING THE STUDENT HEALTH SERVICE FROM 1956 TO 1961.

Year	Non-Attenders		'Physical' Attenders		'Psychological' Attenders					Total
	N	%	N	%	P1	P2	P3	P1+2 +3	%	
1956	23	50	12	25	5	6	1	12	25	47
1957	26	57	8	18	7	2	3	12	26	46
1958	26	54	7	15	6	7	2	15	31	48
1959	18	38	20	43	6	3	—	9	19	47
1960	17	35	13	27	7	11	—	18	38	48
1961	15	31	20	41	7	6	—	13	27	48
Total	125	44	80	28	38	35	6	79	28	284

The relation between academic outcome and health category is shown in Table 2. In view of the small numbers in the sub-groups, Psychological grades 2 and 3 and drop-outs and failures have been combined.

TABLE 2

FINAL EXAMINATION PERFORMANCE OF 'PSYCHOLOGICAL' AND 'PHYSICAL' ATTENDERS AND NON-ATTENDERS.

	First + Upper Second		Lower Second +Third		Failure + Drop-out		Total
	N	%	N	%	N	%	
'Psychological' P2+P3	13	32	17	42	11	27	41
Attenders P1	20	53	10	26	8	21	38
'Physical attenders'	31	39	35	44	14	18	80
Non-Attenders	28	22	60	48	37	30	125
Total	92	32	122	43	70	25	284

It is clear that, whatever the reason for the high overall level of wastage (25 per cent during this period), it is not to be explained in terms of psychological disturbances—at least as far as these can be estimated by disclosure of symptoms to the Student Health Service. The drop-out and failure group tended to use the service rather less for all reasons. It may have contained a higher proportion who were disturbed but 'opted out' but we cannot assess this from the data available. Reported symptoms, on the other hand, characterised those who stayed the course and did well. 53 per cent of grade 1 attenders got first or upper seconds, compared with 22 per cent of non-attenders. (Overall comparison between groups: Chi square 16·03, $p < {\cdot}05$).

Cognitive test results. Though these were not available for the whole population, there were sufficient to enable meaningful comparisons to be made between the groups. These are set out in Table 3.

TABLE 3

DEGREE RESULTS AND HEALTH CATEGORY (PSYCHOLOGICAL GRADES COMBINED) AND THEIR RELATION TO SCORES IN FOUR COGNITIVE TESTS.

Class		Graph-1		AH5 I	AH5 II		General Classification		Valentine's Reasoning Test	
		M	N	M	M	N	M	N	M	N
I and II/I	'Psychological' Attenders	18·4	(14)	20·3	23·2	(14)	112·4	(14)	51·3	(24)
	'Physical Attenders'	19·7	(13)	20·6	22·4	(11)	107·2	(11)	40·5	(20)
	Non-Attenders	18·6	(15)	21·6	25	(9)	101·0	(9)	43·6	(11)
II/2	'Psychological' Attenders	19·3	(7)	23·2	21·5	(6)	116·0	(5)	48·5	(11)
	'Physical' Attenders	19·1	(14)	21·9	24·1	(7)	112·9	(7)	48·7	(17)
	Non-Attenders	18·6	(15)	21·1	23·2	(20)	110·5	(20)	47·4	(30)
III	'Psychological' Attenders	17·4	(9)	23·0	24·0	(7)	114·1	(7)	44·0	(14)
	'Physical' Attenders	18·9	(9)	20·5	22·0	(2)	83·0	(2)	44·4	(11)
	Non-Attenders	17·8	(12)	21·8	24·5	(8)	100·4	(8)	47·2	(18)
F and Drop outs	'Psychological' Attenders	19·9	(11)	21·0	25·0	(4)	109·5	(4)	46·2	(17)
	'Physical Attenders'	19·2	(9)	20·5	23·0	(2)	108·5	(2)	48·7	(10)
	Non-Attenders	19·1	(22)	21·7	24·9	(14)	122·3	(15)	48·9	(33)

The mean scores show no relationship to either illness or academic outcome, with the exception of Valentine's reasoning test. The mean score for this test is significantly *higher* for the most successful students in the psychologically disturbed category (two-way analysis of variance F ratio for interaction$=4{\cdot}541$, $p < {\cdot}01$).

A within-group comparison of reasoning and health category of students gaining first or upper second class degrees showed that the 'psychological' attenders scored significantly higher in the reasoning test than non-attenders and ' physical ' attenders (t values of 3·27 with 42 degrees of freedom, $p < \cdot 01$; and 2.22 with 33 degrees of freedom, $p < \cdot 05$, respectively). The frequency distribution of reasoning tests scores in students obtaining a first or upper second class degree is shown in Table 4.

TABLE 4

HEALTH CATEGORY AND REASONING TEST SCORE DISTRIBUTION IN STUDENTS OBTAINING FIRST OR UPPER SECOND CLASS DEGREES.

Raw Score (Maximum 71)	' Psychological' Attenders	' Physical ' Attenders	Non-Attenders	Total
60–71	7*	—	—	7
50–59	7*	3	3	13
40–49	5	7	5	17
30–39	5	8	3	16
20–29	—	2	—	2
Total	24	20	11	55

* These students were evenly distributed over the six years.

The association between high scores on the reasoning test and psychological symptoms holds only for the ' good honours ' degrees. In the lower categories and among the drop-outs and failures, the association was not significant.

IV.—DISCUSSION.

An association between a high score on a reasoning test, psychological symptoms and academic success is clearly only a small part of a complex story. Unfortunately, the present research could not include any tests of non-intellectual aspects. Other work (Kelvin *et al.*, *op. cit.*) has shown some association between neuroticism and success, and it has been suggested that the ' high drive ' which predisposes to success may also predispose to psychological and somatic manifestations of anxiety. It may well be that such a factor partially accounts for the present findings and could be particularly important in a course demanding consistent application in the understanding and assimilation of large amounts of complex information in a relatively short time. It has been suggested that the chemistry degree course contains more than can comfortably be accommodated in a three-year period, and our findings confirm the impression of considerable strain, particularly amongst the most successful. Though the kinds of symptoms presented were not usually serious from the psychiatric point of view, they should not be disregarded. Their importance lies as an indicator of stresses in a complex interaction between student and department. (It is necessary to point out that in recent years there have been substantial modifications in the course and in the structure of the degree which were made for academic reasons, e.g., to widen the range and scope of the subject and to reduce over-specialisation).

The negative findings are perhaps of greater importance. Whatever the causes of the relatively high level of student wastage, psychological disturbance as reported to a treatment service or lack of ability as assessed by cognitive test scores did not appear to be of importance. It is important to point out that anxiety may be dealt with in different ways—including withdrawal from the stress situation. Further research would be required to elucidate how much factors of this sort are operative in those who withdraw, masking more overt symptomatology.

In a previous study Lucas *et al.* found that both disturbance and lower intelligence were related to leaving college. The explanation of the somewhat different findings presented here may lie in the fact that the chemistry students underwent considerable selection for intellectual ability and previous academic attainment.

For the years in question, the ratio of applicants to places was about four to one. (It does not, of course, follow that the department was ultimately able to obtain all those originally accepted.) The degree of selection may well have eliminated applicants with psychological disturbances liable to reduce academic capacity. In these circumstances, too, the high degree of selectivity produces a relatively homogeneous sample from the point of view of the psychometric tests and thus lowers their potential for discrimination within the sample selected. It is obvious that further research should include measures of personality and motivation, along with the assessment of factors pertaining to the department and the ways in which these affect different types of student.

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SUMMARIES OF RESEARCHES REPORTED IN DEGREE THESES

ATTITUDES OF STREAMED AND UNSTREAMED PUPILS TO STREAMING OF PUPILS BY EXAMINATION RESULTS

By BETTY L. L. LAI

(Abstract of a section of a thesis submitted for the degree of M.A. at the University of Hong Kong, 1968)

Aim : To investigate the attitudes of, and differences of attitudes between streamed and unstreamed pupils to (*a*) streaming by examination results and (*b*) the effects of streaming on learning, competition, social unity, psychology, the slow pupils, the bright pupils and the health of pupils.

Sample and Method : 156 Grade 9 pupils of a school (76 streamed pupils from the highest and lowest ability classes and 80 unstreamed pupils from two parallel classes) were asked to respond to an attitude scale on streaming of pupils by examination results. The scale had the same form as Evans's (1963) and it was scored employing Castle's Scale Product Technique (1953). The internal reliability of the scale was established by selecting attitude statements with a significant r-biserial correlation and its internal consistency was revealed by a high significant correlation of 0·97 with the split half method.

Results : (1) Both streamed and unstreamed pupils had favourable attitudes to streaming by examination results.

(2) The unstreamed group favoured streaming by examination results more than the streamed group. The order of attitude scores, from the highest to the lowest, was first the streamed upper pupils, followed by the unstreamed group, then the streamed lower pupils, but the differences among them were not statistically significant.

(3) Both groups of pupils thought that streaming by examination results would have a good effect on learning, competition, social unity, pupil psychology, the slow and the bright pupils ; but it would be detrimental to the health of pupils.

(4) The unstreamed group held the view more strongly than the streamed group or the lower stream pupils, that streaming would help the slow pupils. The unstreamed group also held more strongly than the upper stream pupils that streaming was not detrimental to the health of pupils. The upper stream pupils held more strongly than the unstreamed or the lower stream pupils that streaming would help the bright pupils. These differences were significant at the 1 per cent level of of confidence.

Topics requiring further study include : (1) Whether pupils' positive attitudes to streaming by examination results merely indicate that they favour a practice familiar to them ; (2) Whether streaming by examination results is detrimental to the health of Hong Kong pupils who are already pressed with a strong emphasis on an academic curriculum and examinations ; (3) Whether there is a method of streaming which will induce the greatest pupil progress and how to encourage a positive attitude among pupils towards such a method of streaming.

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THE DEVELOPMENT OF THE CONCEPT OF NOTATION

BY M. GRANT

(*Abstract of thesis submitted for the degree of M.Ed., University of Manchester,* 1969)

AIMS: To follow Piaget's study (1952) of the development of number: to devise tests of natural number concepts using larger quantities than he did; to explore some aspects of the development and relationship of the concepts of notation and natural number.

SAMPLE: 200 children between the ages of 6 : 8 and 11 : 1: 20 boys and 20 girls at each of five age levels, with mean ages of 6 : 10, 7 : 10, 8 : 10, 9 : 10 and 10 : 10, drawn equally from two similar schools in urban development just outside a large city.

PROCEDURE: Each child was tested by the 'clinical' method with questions presented in a standard form but followed, when necessary, by supplementary questions to obtain the fullest possible insights into the child's thought. A form was devised to record as many as possible of each child's responses and actions.

Preliminary tests were used to establish rapport. The child was asked to read and then write symbols of two or three digits. *Test* 1 examined the child's verbal explanations of the meaning of each part of the symbols 13, 24, 16 and 36, in relation to the same symbols in written word form. *Test* 2 tested the conservation of discontinuous quantities, distributed at random in two ways, a wide spread and a close spread. Smaller numbers were used for children who could not count out equal sets of 124. Non-conservers of the large number were tested again with smaller numbers. *Test* 3 made single elements into new composite units, which could be compared with single elements and reversed. *Test* 4 was another test of conservation with two groups, one of which was divided into three definite sub-sets. Four extra elements were then added to the displaced group. *Test* 5 attempted to find out how the child compared the relationship of place between two and three digit numerals. In *Test* 6 the child was asked to build a staircase with separate graded cards to 10. If he succeeded, he was asked to build a series to 40, and helped when necessary. Questions were then given on ordination. *Test* 7 examined the class concept, in which the whole class embraced two sub-classes, one of which contained composite elements, and the other single units.

The children's responses were classified, by inspection, into stages showing the development of the concept under consideration. The number of stages varied according to the test, and categories were combined to follow those defined by Piaget: pre-operational, transitional and concrete operational. The categories of the responses were plotted against chronological age, and for the two schools and two sexes separately.

RESULTS: (1) The responses could be categorised into three stages similar to those used by Piaget (1952).

(2) Conservation of a large number of discontinuous quantities is complete for over three-quarters of the sample at about 9 years, though many show the ability to count well before that age. A few children can conserve a small number though they cannot conserve a larger number, which they can count competently.

(3) Conservation of discontinuous quantities divided into definite sub-sets develops more slowly than for a random spread. Over half the sample at about 8 years conserved, but the increase with age after that was very slight, with 62·5 per cent conserving at nearly 11 years. The addition of a few elements caused a conflict in about a quarter of the children, who then conserved.

(4) The understanding of a superordinate concept of a composite unit develops in regular age stages, but it is not until about 10 years that three-quarters of the age sample can identify and reverse the new entity.

(5) Asymmetrical relations of pure number produce results like those of Piaget (1952), but conventional notation of numbers up to 40 shows slower development; ordinal numbers are understood by slightly less than half the sample of about 11 years.

(6) The test of the place values of the symbols (Test 5) produced very few transitional stage responses, and by about the age of 11 years slightly less than half the age sample were able to analyse the relationship between the place and the value of the symbols.

(7) Numbers in written word form were analysed at about the age of 11 by an eighth of the sample.

(8) The logic of class was spontaneously understood by none of the sample (Test 7), although 20 per cent at about 11 years analysed after some help was given to focus attention on the three aspects of the problem: whole class, composite entity sub-class and single entity sub-class.

(9) Differences between the schools and sexes were only slight.

(10) Concrete operational thought in related fields of number does not necessarily develop at the same time.

(11) In this investigation, understanding of pure number comes before the development of secondary man-made concepts, presented here as some aspects of the notational system.

REFERENCE.

PIAGET, J. (1952). *The Child's Conception of Number.* London: Routledge and Kegan Paul.

(*Manuscript received* 16*th August*, 1969)

THE EDUCATIONAL PERFORMANCE OF CHILDREN WITH EPILEPSY

BY C. R. BAGLEY

(*Abstract of thesis submitted for the degree of M.A., University of Essex*, 1967)

AIMS AND METHODS: Consecutive referrals to the neurological department of a London teaching hospital were examined, and children with epilepsy uncomplicated by other handicaps were selected for study (N=118; mean age 12·6, SD 2·9; 74 boys and 44 girls). An investigation was made of a variety of social, psychological and medical factors which might underlie educational performance.

In addition to investigations in the hospital, the child's teacher was asked to complete a questionnaire, and an investigation was also made of parental attitudes to the child.

RESULTS: The mean WISC IQ was 99·2 (SD 21·8). The distribution was significantly skewed from normal, there being a larger number of children of low intelligence and a smaller number of particularly bright children. Despite the fact that very few of the children were referred on psychiatric grounds, the application of Rutter's teachers' questionnaire found that 40 per cent of children had a serious psychiatric handicap.

On the basis of psychiatric symptoms displayed, subjects were classified as 'normal' (N=35), 'anxious' (N=28), 'aggressive' (N=30) and 'mixed' (N=25).

Matched controls for the disturbed children were obtained from a child guidance clinic. Controls were matched for symptoms as well as for age, sex and occupation of parents. Arithmetic and reading age discrepancies were measured by the difference between the WISC verbal mental age and the arithmetic and reading ages on the Schonell tests.

TABLE 1

ARITHMETIC AND READING AGE RETARDATION.

	Epileptic children				Non-epileptic children		
	N	AX	AG	M	AX	AG	M
Arithmetic age retardation (months)	–23·1	–8·0	–30·5	–24·0	–10·3	–18·0	–15·4
Reading age retardation (months)	–4·8	–15·8	–11·9	–11·2	–14·0	–16·4	–15·1

N = normal ; AX = anxious ; AG = aggressive ; M = mixed.

Differences greater than 10 months are significant at the 5 per cent level and beyond.

These findings suggest that RA retardation is associated with psychiatric disorder rather than epilepsy, while the very high level of AA retardation in epileptic children is associated with epilepsy as such, rather than with psychiatric disorder. However, anxiety in the epileptic children is associated with an improvement in arithmetic performance.

Further significant correlations of RA retardation were AA retardation (r= ·26); and " mother's over-ambition for child " (r=—·21) ; there was also a significant association with male sex. The individual symptoms with the highest correlation with age were ' school refusal ' (r= ·25) and ' stealing ' (r= ·40).

Significant correlations of AA retardation were age (r= ·24) ; ' mother's over-protection ' (r= ·22) ; and a heredity of epilepsy (—·34). Individual symptoms with the highest correlation with AA retardation were ' disapproved sex behaviour ' (r= ·39) and ' school refusal ' (r= ·28). None of the neurological variables examined (brain damage, kind of fit, frequency of fit, and type of EEG) showed any significant correlation with AA or RA retardation. Surprisingly, brain damage had no correlation with level of IQ, but had a significant correlation (r= ·24) with verbal-performance discrepancy on the WISC. IQ correlated —·25 with a diagnosis of aggression, and ·45 with a diagnosis of anxiety.

A questionnaire completed by the teachers of 109 of the epileptic children showed that only 43 were aware that the child had epilepsy. Teachers were asked to estimate the child's IQ in five categories ranging from ' well below average ' to ' well above average.' In 28 cases the teachers seriously underestimated the child's intelligence as indicated by the WISC (e.g., in eight cases children with IQ 120 and above were said to be of 'average' intelligence). It seems that teachers often equate the child's current academic performance with his basic intelligence, without being aware of the problem of under-functioning.

REFERENCE.

RUTTER, M. L. (1967). A children's behaviour questionnaire for completion by teachers. *J. Child Psychol., Psychiat.*, 8, 1-11.

(*Manuscript received 28th September*, 1969)

CRITICAL NOTICES

EDUCATIONAL RESEARCH IN BRITAIN

By L. B. BIRCH
(*McGill University*)

BUTCHER H. J. with the assistance of H. B. PONT (Edit.) (1968): *Educational Research in Britain*. University of London Press pp. 408 63s.

An interesting prelude to reading this collection of articles is to look back 10 years to a paper in this Journal by Wiseman (1959) which he called *Trends in Educational Psychology* and to the Symposium *Educational Psychology Today* published in 1962. Two of the contributors to the 1962 symposium, Wiseman again and Wall, also have contributions in the 1968 volume so that comparison of their papers is particularly interesting. Historically, less than 10 years seems a very short while to look back, yet such has been the rate of development in educational research in Britain that the exercise is well worth while. It is also a little reassuring, for, while on the whole the earlier papers stress the inadequacies of British research, the present volume is generally optimistic for the future and even a little self-congratulatory on the progress made in the immediate past. This is clearly seen in comparing the two papers by Wall, for in 1962 he felt constrained to say that he found himself in agreement with Wiseman " that in the present state of opinion and with university education departments staffed and organized as they are no rapid expansion is possible . . . " (p. 226). In 1968 he wrote : " The last six or seven years have been marked . . . by an almost explosive interest in educational research . . . " (p. 16).

The symposiasts of 1962 complained that far too high a proportion of research was either that carried out in studies leading to higher degrees, or by single researchers working on their own with limited, and often no, funds. Many of these people were in small departments, isolated from their kind, sometimes poorly trained, often lacking in physical facilities, and frequently discouraged by lack of interest and research competence of the heads of their departments. There was an almost complete absence of large scale research supported by public money. The early history of the National Foundation for Educational Research and, even more remarkably, of the Scottish Council for Research in Education, tells of an astonishing output of research carried out on a tiny budget. Ten years ago there were, of course, very few sources of financial aid which the individual researcher could tap and the suggestions, by Peel and Wall, in the 1962 symposium, that there should be parallel bodies to the Medical Research Council and Department of Scientific and Industrial Research, whose interest was in education, seemed strangely Utopian when they were made.

The lack of money devoted to research in education was inevitably reflected in the number and the quality of the people involved in it. Wiseman (1962) asked : " What would happen if some fairy godmother suddenly produced a million pounds for educational research ? " He then went on to say that he thought that such a sum, or even one tenth of it, would cause the universities extreme embarrassment " because of the shortage of men and machines—and the organisation necessary to employ these effectively." The unpleasant truth was, of course, that education had a deplorable image in British universities and few university teachers regarded it as an academic discipline, let alone a field for serious research. It is not surprising that educational administrators made their decisions very largely without reference to the findings of research.

It is difficult to pin-point any particular cause of the enormous expansion which has taken place. Undoubtedly personal representations made by influential professors of education and directors of the research institutions to sympathetic and informed Ministers of Education played their part, but perhaps most important was the need felt to re-evaluate the whole course of public education which led to the setting up of the Crowther, Robbins, Newsom and Plowden Committees. The climate of informed opinion was such that these bodies could not report, as others before them had done, largely as a result of pooled opinion. They had to have the facts. This led to the collection and manipulation of data by sophisticated up-to-date procedures, and, particularly in the last committee, to the initiation of genuine research designed to provide answers to specific questions. An example is to be found in a valuable article in this volume by Wiseman entitled *Educational Deprivation and Disadvantage.* Some of the surveys and research arising from these committees were of a magnitude rarely seen previously in Britain. They demonstrated the value for decision-making in education, as in other fields, of large-scale well-organised research.

Whatever the immediate causes, there is no doubt that one essential requirement for expansion in educational research, that of money, became available in increasing amounts during the past decade. Wall estimated that the amount available in 1967 was probably 30 times that in 1958 and was still rising. The actual amount was certainly of the order imagined by Wiseman's " fairy godmother " in 1962. Butcher's book gives at least a partial answer to Wiseman's question as to whether researchers and institutions would be embarrassed by sudden riches. The reading of the 18 papers published here seems reassuring. There has been a great deal of competent work done in the last five years or so and the rate of production is rapidly increasing. However, it should be noted that Wall, in his article on the NFER, comments on the acute shortage of adequately trained workers and a glance at the recent contents pages of this Journal shows comparatively few new names among the authors. It would seem that the new ferment has not yet given rise to a substantial increase in the number of independent research workers. There has, however, been a considerable increase in the amount of team research carried only. Some of this is on a large scale with fairly sophisticated data collection and analysis and is being carried out, not only by the universities and the well-established Scottish Council and the NFER, but also by the newer bodies such as the National Bureau for Child Care and the Centre for the Study of Human Development of the London Institute of Education. Dreams that there might be educational equivalents of such bodies as the MRC and the DSIR have become realities and the MRC itself has financed work of great relevance for education such as that carried out by J. W. B. Douglas's unit at the London School of Economics.

A volume like this could easily have been very dreary, in fact a sort of annotated bibliography. That it is not is greatly to the credit of the editors who have effectively prevented overlap between the various contributors, provided excellent cross-references within the text (there are almost no footnotes), a good index and an extensive bibliography. Otherwise, they seem to have given complete freedom to their authors to develop their topic in any convenient way. In fact, the range of treatments is very wide. Some authors have restricted their coverage strictly to specific dates, e.g., Lovell who, in his paper on *Backwardness and Retardation* deals only with publications between 1962 and 1966 ; others have found it helpful to go further back in time to establish the determinants of current research.

Not all authors seem to have had quite the same readers in mind or the same purpose ; hence the level of writing is somewhat uneven, although not sufficiently so to detract seriously from the book. On the whole the least successful articles are those in which the authors have chosen to review existing publications in the field after the manner of the opening chapters of many Ph.D. theses. The most successful, and for students, who will form a large readership for this work, the most useful, are those papers which form a complete essay on their topic, using research findings as supporting evidence. Fortunately, many of the papers use this approach. Pilliner, for example, gives a very easily read account of the nature, purpose, functioning and consequences of examinations which says almost all that need be said on the topic until it is necessary to deal with the actual techniques of mental measurement.

Lunzer in *Children's Thinking* gives in 30 pages a critical survey of the whole position of Piagetian research in relation to an understanding of children's thought processes. Lunzer pays little attention to the boundaries of country, race or time; his references have only one criterion, that of relevance to the closely argued theme. This well-written paper will be of great help to advanced students who, having read a lot of Piaget, at first and second-hand, still need help in getting an overall view of the enormous contribution of the Geneva School. Butcher's own contribution on *University Education* is another example of a survey article which gives a very complete picture of the developing research in the field; so also is Kay's scholarly, lucid account of *Programmed Learning* and there are many more examples which could with equal justification be cited.

One recurrent feature which characterises much of the work recorded here is the tremendous influence of Piaget's work. This has already been referred to with reference to *Children's Thinking* but it also appears in such areas as moral development, emotional development, and the curriculum. Many universities are engaged in Piagetian studies but especially Manchester, Birmingham and Leeds. Particularly valuable has been the contribution of Lovell and his associates at Leeds. Little of this work has been as spectacular as some, but in a number of significant areas key researches of the Geneva school have been repeated and extended under rigorous experimental conditions, then, after verification, the findings of individual researchers have been integrated into wider theoretical constructs.

From this collection of articles the reader is able, with some precision, to define some of the major areas of rapid productive growth. It is also possible to see some fields in which research, for the time being, could well be discontinued and also where large amounts of work appear to be yielding very little. Further areas may also be detected where research seems to have become divorced from the needs of educators and could well be redirected.

The devoted work of Dale to the problems of co-education is an example of research which seems unlikely to yield much more of immediate value. Research into reading is an area where some fresh approaches are urgently needed. There is still no coherent theory to account for reading failure or any convincing plan for diagnosis and treatment. There seems little point in more surveys, more reading schemes, more studies of laterality, dominance or perceptual anomalies, or the devising of more tests unless these are incorporated in more rigorously designed experiments testing specific hypotheses.

The admirable article by Kay on *Programmed Learning* provides an interesting paradox. In many ways it reveals an area of activity at the forefront of modern technology culminating in electronically-controlled adaptive teaching systems. At the same time a description of the actual research being carried out has for educators in the schools, as compared with trainers in industry, a somewhat old-fashioned ring. Modern curriculum planners have for some time placed less and less emphasis upon the material content of their courses. They do not start with the premise that there is a universe of knowledge which has to be chopped up by the teachers into small palatable bits and fed as expeditiously as possible to the pupils. They are only too well aware that most of what they teach will soon be forgotten or out of date. The schools are very much more concerned with the acquiring of attitudes and learning-skills which will make the student able, to a significant extent, to control his own future educational development by taking from any available sources the knowledge most relevant for his contemporary needs. Teaching children along these lines involves a great deal of independent seeking and enquiring by the pupils by reading books and by direct observation and experiment in a wide range of situations. In this way they become progressively more responsible for their own educational development. This does not deny the need for more good programmes especially in tool subjects like using a calculator or understanding the mechanism of genetic inheritance or of a gas-turbine; but making a programme is development, not research. At present much of the research in programmed learning seems quite trivial and of little practical importance. If this work is really (to quote Kay) " basically a demand for educational efficiency " then a new look is needed to make it more relevant to educational practice of the future not of the past. In this researchers might usefully start by looking at those sections of the article by Williams on *The Curriculum* where he looks ahead of present practice to a curriculum which is interdisciplinary and mainly concerned with the solution of real problems appropriate to pupils' level of development and where thinking tends to emphasise the upper rather than the lower levels in Bloom's Taxonomy.

Finally, we should perhaps, consider the readership of the book. I think it will be of greatest value in colleges and departments of education for use with post graduate students who are working towards higher degrees. These students will find it very helpful to get a quick overview of a large area of educational research ; later they will find it a useful start in the narrower fields in which they intend to carry out their own research. With the arrival of a promised second volume this function will undoubtedly be enhanced. Students living outside Britain, particularly in America and Canada, have usually found they have enough to do to cope with their own outpouring of publications and so have neglected some of the really important work done in Britain. This reasonably sized and priced volume should make it economical for them to incorporate British findings in their thinking. Mature researchers will find it useful in indicating areas thought of as remote from their own, where converging lines of enquiry show their growing relevance. This is an excellent publication which should do much to advance research in education.

DEVELOPMENT IN LEARNING

By GEORGE SETH

(Department of Psychology, Queen's University, Belfast)

LUNZER E. A. (Ed.) (1968). *Development in Learning I : The Regulation of Behaviour*, pp. xiii+392.

LUNZER E. A. and MORRIS J. F. (Eds.) (1968). *Development in Learning II : Development in Human Learning*. pp. xv+487.

MORRIS J. F. and LUNZER E. A. (Eds.) (1969). *Development in Learning III : Contexts of Education*. pp. xiv+312.
London : Staples Press, 70s. each.

> " You make a great, a very great mistake, if you think that psychology, being the science of the mind's laws, is something from which you can deduce definite programmes and schemes, and methods of instruction for immediate school-room use. Psychology is a science, and teaching is an art ; and sciences never generate arts directly out of themselves. An intermediary inventive mind must make the application, by using its originality."
> —WILLIAM JAMES, *Talks to Teachers*.

The Three-Decker was Kipling's ironical obituary for the three-volume sentimental lending-library novel. It marked the end of a literary era. I am disposed to hope that the three-volume format of Development in Learning does not signalise in the time-span of British educational psychology the beginning of another. It certainly represents a massive onslaught by no less than 21 intermediary inventive minds upon the task of applying a number of somewhat different psychologies to the art of education, all of them being valiantly led by Lunzer and Morris to a destination (or perhaps several destinations) that remain somewhat uncertain. Volume I of the series was originally intended to be a mere chapter or two of learning-theory-exordium, and if the editors had held clearly before them their intended audience, it might with advantage have remained so. But Professor Lunzer seems to have fallen victim to the hazard that besets much literary production, namely, that the book grew, surely beyond reason, under the hands of its editors and authors. The trilogy is now presented as " a comprehensive introduction to the psychology of education designed to serve as a basic text for students preparing for advanced diplomas and degrees in education or (*sic*) in psychology." The larger hope is that each of the volumes will also be useful to students taking a three-year course in colleges of education. It is certainly not a series of ' talks to teachers,' and it is as a text-book (or a series of text-books) that the publication calls for assessment.

The Regulation of Behaviour, for the most part by Lunzer, deals first with ' classical ' learning theory from Thorndike and Pavlov to Hull and Skinner, with a chapter by Nevile Moray on the physiological processes of learning. There follows a long account, influenced by Lewin and Hebb and Miller, Galanter, and Pribram, of Lunzer's ' structural ' approach, leading into the sections in which Piaget's doctrinal position is central. The volume represents Lunzer's recognition of one of the basic problems for all who try to teach psychology to teachers—namely, that these students usually come to the study of what is essentially an ' applied ' branch of the subject with little or no grounding in the general, and essentially biological foundations of the science of behaviour. Obviously, the time available to provide for this in the ordinary course of teacher-education or for a post-graduate diploma, is so short that many lecturers do not attempt to deal with it at all. But the involved, abstract and tortuous presentation of much of the material in this volume is such that its educational relevance vanishes for most of the time below the surface, and the reader longs for a breath of the lucid literacy of James, or Boring, or Hebb or even of the bread and butter clarity of E. L. Thorndike.

Learning theory, as it has developed in the aftermath of Watsonian behaviourism, has had singularly little impact upon what happens in the school room. Indeed, except for some clues about reinforcement, and the advent of teaching machines and programmed learning, it is doubtful whether it has had any impact at all. Lunzer's discussion of the ' structural ' approach and of motivation is certainly one man's major attempt to rethink the account of learning (in the fitful light of Lewin, Skinner, Deutsch, Lorenz, Broadbent, and Miller) in a way that will bring it closer to human learning and to education. But Lunzer, educationist though he is, fails in this volume to carry *educational* conviction, and himself needs his interpreter. Achievement falls short of aspiration, and the story remains obscure and remote from the classroom. Lunzer criticises the vacuum that has existed since E. L. Thorndike's domination of American educational psychology and educational practice, and sets out at length his own position—which depends chiefly upon Bartlett's theory of the schema, on Piaget, and on recent developments in psycholinguistics. It is unfortunate that this could not be done much more briefly and in readable sentences. There is no case in the present context for an extended excursion into theoretical and historical erudition, which for the most part fails to advance the specific enterprise of instruction which the trilogy represents.

Much that goes on in any school room, whatever the preferred techniques may be, consists, as Lunzer holds, in transmission. It seems dubious, however, and indeed to some extent to misrepresent his own position, for him to equate the process of education with the *transmission of behaviour*. But there can be no quarrel with his view that the aim of educational psychology is to construct an adequate scientific theory to account for the process of education, however it be defined. He is, therefore, right to argue (Vol. II p. 440) that educational psychology has been too much and too long involved in the devising of " techniques for measuring whether behaviour has been transmitted or not, i.e., whether learning has occurred and how much." The consequence is that for the editors of *Development in Learning* the psychology of education must be concerned primarily with the psychology of child development, and in particular with the study of the processes of children's learning and of teacher-pupil interaction.

This is certainly the consistently held viewpoint from which *Development in Human Learning*, Volume II of the series, has been constructed. This is rightly regarded as the core of the series and as such it has been designed to give specific coverage to all the main areas of children's psychological maturation and learning: perceptual and conceptual development; skill and reasoning; personal-social development; language, reading, and mathematics. Some of the individual papers avoid the general strictures noted above, but not all of the writers appear to have had their sights directed upon quite the same target area. Some of the papers, however, are in themselves very good indeed: notably, in the opinion of this reviewer, M. D. Vernon's clear and comprehensive account of perception and perceptual learning; Skemp's study of " abstract schematic learning, in its purest form " in mathematics; Roberts and Lunzer on the ramifications of the specific linguistic and basic educational skill of reading and the psychological relevance of the different ' methods ' of teaching children to read; Reed's delightful paper on skill, marred only by some lack of appreciation of Gesell's views on maturation as being supposedly adequately represented by the famous ' co-twin control ' experiments. Herriot's short chapter on the experimental psychology of grammar is neat and even impressive but it is unfortunately typical of those papers that seem to be pitched at a level that is inappropriate to the ' text-book ' intention, and that presupposes a background of technical psycholinguistic sophistication that few of his readers will command.

Contexts of Education is the somewhat whimsical and slightly misleading title of the third volume of which Part I, constituting more than half the book, is quite explicitly concerned with various aspects of individual differences. This section of the book has A. D. B. Clarke on intelligence, largely reprinted from *Mental Deficiency: The Changing Outlook*, which has determined the rather special, and somewhat dubious point of view from which it is written; Butcher on human abilities, mainly although not wholly devoted to ' creativity '; Warburton on the assessment of personality traits; Stott on personality and maladjustment; and Cashdan on handicaps in learning. It might have been better if Clarke's paper had been given a more suitable title, or if indeed Butcher had had somewhat wider terms of reference which would have enabled him to cover in one chapter the whole area of intelligence and human abilities differently from and less controversially than Clarke. Warburton surely deserved an A-rating for beginning at the beginning and telling his ignorant reader how the job (as he sees it) is done, and for his wryly wise scepticism about the relevance of his discussion to classroom problems. Stott's contribution lives up to some expectation of idiosyncrasy in its conceptualisations, but it is perhaps on that very ground the better for the ' professionals ' in the clinics and the school psychological services, whose noses are nearer to the grindstone, and whose diagnoses and prescriptions, as they would be the first to admit, are frequently somewhat deficient in theoretical underpinning.

Part II (edited by Morris) on the environment and the learner, has three chapters by Blyth, Morris and Hargreaves, all with an explicitly sociological-social-psychological orientation. To this reviewer these seemed to constitute in many ways the most satisfying unit, both in conception and execution, of the entire trilogy. It is not pretentious; it is clearly written and it is clear about its purpose; its authors obviously understood that a text-book should do an honest job of instruction; that it could be avowedly pedagogic without being off-putting or patronising; and that it was more likely to be interesting if it kept closely in touch with the realities of the school and of the wider social environment.

It is difficult to write a succinct or summary evaluative comment on a 1,200-page collection of material—a collection rather than a symposium, expressly intended as a text-book but not unified or integrated by the single steadily held point of view of a single author, nor yet the product even of a single stable. Taken as a whole it must be the most ambitious attempt ever made in this country to produce a single text-book that would cover virtually the whole area of educational psychology. As such it is important, because it is likely to be widely used. That it has not been entirely or uniformly successful is neither surprising nor matter for condemnation out of hand. Inevitably, different writers have made their contributions at very different levels, and in styles of widely differing readability, and the attempt to impose theoretical consistency upon the whole has been ultimately self-defeating. Volume I is surely wrong in this context. It would be unnecessary in its present form for any moderately sophisticated psychological reader, and useless (again in its present form) to any other. Fortunately, Volumes II and III can stand on their own feet, and have in them much that is valuable for the student of educational psychology, being well-organised or easy to re-organise for any course to be conducted at graduate level on seminar lines. The particular value of these volumes is not only that they betray a refreshing familiarity with relevant British and European, as well as American, research, but more important, when they succeed in making their educational relevance clear, it is to the system, the schools, and the classrooms of this country that they are applicable. American and British rats may be interchangeable. Neither the school children nor the school systems are! Educational psychology must be relevant to the culture and the system in which it is to be applied.

LEARNING AND TEACHING

By G. W. H. LEYTHAM

(*Audio-Visual Aids and Programmed Learning Unit, University of Liverpool*)

STONES, E. (1968). *Learning and Teaching: A Programmed Introduction*. London: John Wiley and Sons, pp. 114, 21s.

This review is based largely on the results obtained from a research investigation in which Stones's book was compared with two other methods of presenting the same material. While it would be wrong to generalise from an experiment using only one group of students, it is felt that this provides a firmer basis for appraising the book's usefulness than a purely armchair criticism. Before considering the empirical evidence, however, it might be as well to give a brief description of the aims and content of the book, and of the mode of presentation used in it.

In the Tutor's Handbook, which can be obtained from the publishers, Stones indicates that: " The programme has been written for students reading education in colleges of education or universities." He says that it aims to introduce these students " to some basic ideas concerning the nature of learning and to suggest how they might be relevant to the classroom." Some current views on ' a theory of instruction ' are also included.

The book is divided into nine parts and is intended to be covered in a term as part of a course in educational psychology. Part 1 introduces the student to some of the elementary aspects of learning, such as conditioned responses (Pavlov), instrumental learning (Thorndike), and reinforcement. Part 2 is concerned with learning as adaptation, and devotes a fair amount of space to the workings of a WC cistern. This is used to illustrate the self-regulating mechanism called ' feed-back,' and to prepare the student for a discussion on cybernetic systems. A distinction is made between dynamic and static equilibrium and all these rather mechanical analogies are used to introduce the idea of adaptation as a form of accommodating to one's environment. The first two parts thus provide rather different approaches to learning, and also serve to present some of the key concepts to be used in later sections. Part 3 is concerned with aspects of reinforcement, where Skinner's concept of extinction is applied to classroom behaviour. Generalisation and discrimination are similarly applied to learning in school, while the relationship between the teacher and the pupils is presented in the form of a cybernetic system with feedback operating in both directions.

From simple types of learning, the programme passes, in Part 4, to chaining and learning sets. The application of backward chaining in teaching is described and this leads on to a description of Harlow's work on learning sets. Examples of his oddity experiments with monkeys and children are given, and the results applied to teaching.

At a higher level of complexity, Part 5 deals with concept learning and language, and indicates how children can be taught to learn concepts, with examples from the work of two Russian psychologists. In Liublinskaya's research, very young children were taught to select the smaller of two objects by hearing the word 'small' whenever they picked the correct one. Luria has shown a similar interest in the help that children receive from adults and his reported studies also indicate that linguistic 'labels' facilitate the formation of concepts in the early years of life.

Part 6, entitled "The Child's View of the World," is devoted mainly to the work of Piaget, with various examples of his research into the different stages of development. In Part 7, Stones presents his own view of cognitive structure, which is of a hierarchical nature. This is used to discuss transfer of learning.

In Part 8, the various aspects of learning are related to the process of instruction, with special reference to Gagné's model. There is also a brief description of 'discovery learning,' which is regarded as opposed to the approach expounded in the programme.

The final part of the book brings in the principles of programmed learning, without referring to them as such. The precise statement of aims is discussed, followed by a reference to task analysis. The usefulness of a 'readiness test' is indicated, and related to the need for prior learning before embarking on a specific course of instruction. The remainder of this section seeks to integrate material presented in the previous parts of the book and to show how it can be used as a guide in teaching. The student is required to see the relevance of the knowledge he has gained so far, and to transfer it to different teaching situations. As in the rest of the book, this involves making verbal responses to verbal questions. For instance, the last frame of all asks: "By what means, other than providing knowledge of results, can the teacher reinforce the learning activity of children?" The expected answer is: "By expressing approval of their work."

In applying the principles of programmed learning to his own text, Stones has not adhered strictly to either the linear or the branching format. Most of the frames require a short, verbal answer, which the student can either write down on a separate sheet of paper or merely keep in his mind until he uncovers the suggested answer printed underneath the frame. Some multiple-choice questions are included, but no remedial frames are provided for incorrect answers. A series of review frames is included at the end of each section and in case of error the student is referred back to the earlier frames dealing with that particular topic. A helpful plan is provided at the beginning of the book and this can be cut out to act as a mask which is run down each page to reveal successive frames with their associated answers.

The number of frames in each part, including review frames, varies from 35 to 68, and the suggested working time for each part ranges from 40 minutes to one hour. In all, there are some 460 frames, requiring about 7¼ hours' work. This gives an average of about one frame a minute, which gives some idea of the level of difficulty involved. The given times are based on the actual performance of various groups of students and frames themselves have been subjected to various trials before reaching their present form. Unlike so many programmes, this one has been subjected to a rigorous, prior, empirical testing on a relevant sample of students, and a fairly comprehensive validation has been carried out, using a test drawn up by the author. He gave the test to students before and after working through the programme and, at the same times, to an equivalent group who did not use the programme. The experimental group showed a marked improvement, while the control group showed no significant improvement at all. This and other information is contained in the Tutor's Handbook. A copy of the test and answer key can be obtained from the author on request.

The investigation, carried out by this reviewer at Liverpool, was not so much concerned with validating Stones's programmed text as with comparing its efficiency with more orthodox methods of teaching. Over 180 post-graduate students, on the one-year Certificate in Education course, were randomly divided into three groups. One group attended a series of lectures of the chalk-and-talk variety, another had lectures where the main emphasis was on visual illustrations, while the third group worked through *Learning and Teaching*. The experiment took place in the autumn term as part of a regular course in educational psychology, and all groups covered much the same material. Students met twice a week, at the same times, but in different rooms. Eleven successive periods were involved : all students completed Stones's test on the first and last occasions, and the programme group read his text at the rate of one part each period during the nine intervening sessions. Towards the end of the summer term, some six months later, a sample of items from Stones's test was again given to the students.

From the results of the above research, it is obvious that the programme is superior to the other teaching methods in the following ways :

(1) Significantly higher scores were obtained on the post-test taken immediately after completing the programme.

(2) Significantly greater improvement took place between the pre-test and the immediate post-test.

(3) Significantly higher scores were obtained on the delayed post-test taken some six months after completing the programme.

It is interesting to note that although inferior to the programme group on all the above criteria, the visual-lecture group was superior to the straight-lecture group on items (1) and (2), but not on (3).

In assessing the value of the programme, both in terms of early and delayed recall, it should be added that not all students working through it required the full time allocated : some completed a section in half-an-hour or less, so that in many cases their superior results were achieved in less time than would normally be devoted to the same materials in lectures. The fact that the students learning from the programme could proceed at their own pace is probably the most important one in accounting for this increased efficiency.

When improvement on individual test items was considered, the programme group was not always superior to the lecture groups. The latter did rather better on certain items concerned with cybernetics and Piaget's views on concept formation. Visual aids seem to have helped these students, suggesting that the diagrams in the programme are not as useful as they might be. Some of these, for instance, depict the workings of a WC cistern, which is used to exemplify a self-regulating mechanism. Students did not seem to find this very helpful, and a printer's omission in one of the diagrams led to some confusion. In frame 2·5, there should be water issuing from the tap, and in the absence of this, the student cannot answer the question posed in this frame. Better illustrations might also have been given for the feedback principle used in cybernetic systems. Several diagrams are used to illustrate Piaget's work, but here again, there is room for improvement.

At the end of the academic year, and before the results of the experiment were made known to them, the students' attitudes to the various methods used were sought on a brief questionnaire. They were asked to indicate which of the three groups they would have joined, had they been free to choose at the beginning of the experiment, and also which one they would now choose, as a result of their experience during the course. In the programmed learning group, 72 per cent of the students either maintained their original choice of the programmed text or changed from one of the other methods to the programme. This apparently favourable reception of Stones's book was somewhat offset by the remarks made about it in a more open-ended question, seeking the students' reactions to the programmed method of presentation used. 40 per cent of the group gave more or less favourable comments, but 24 per cent made unfavourable remarks about the procedure. The remaining 36 per cent were somewhat mixed in their feelings, and their attitude could be summed up in the statement made by many of them : " Efficient but boring." The favourable reaction which occurred most frequently referred to the fact that the individual could go at his own pace. For instance, one student wrote : " Great advantage of being forced to think. Could go at own pace." At the other extreme was the statement: "Totally useless to a person of my temperament. No incentives provided to work. I prefer to study and discuss matters more intimately connected with children in schools."

Unfavourable comments were more concerned with the content of the book than with the programmed format. These students were training to teach in secondary schools, and many of them felt that the material was too much concerned with young children. It is very difficult to please everyone, and no doubt each student and lecturer would have his own views on what should be in a book of this sort. Although covering a fairly international spectrum of research on learning, Stones's book does not present a very broad approach to the subject. Most of the emphasis is on cognitive learning and, in spite of the prominent part played by reinforcement, little is said about motivational factors in the learner. It is assumed that getting a problem correct and receiving approval are sufficient to bring about learning in the classroom. This seems to be only half the story and tends to leave out the emotional aspect of learning. In some ways emotional learning is more important than cognitive learning from the individual child's point of view. Psychologists have tended to treat emotions as rather separate from other aspects of human life, but they are obviously an integral part of it, as has been shown by the work of O. H. Mowrer. Recently, Maslow has drawn a distinction between extrinsic learning and intrinsic learning, the former being concerned with factual knowledge and the latter being concerned with individual growth and development. Stones's book is heavily weighted on the side of extrinsic learning and the intrinsic aspect tends to be covered only by implication.

In the Tutor's Handbook, Stones, in discussing the terminal behaviour to be expected as a result of reading his book, says: "Presumably there would be general agreement that a programme such as this should help to improve teacher competence." He indicates that this is difficult to assess, and gives this as the reason for substituting his verbal test. In our investigation, we found that his programme was superior to lecture methods in preparing students to attain a high score on the test. However, it has been shown by Pikas that, while programmed methods produce better results on tests with a similar content to the programme, this does not hold where the test is not so closely related. It may well be, therefore, that the success of our students was partly due to the fact that the same person wrote the programme and the test. Be this as it may, a much more disturbing doubt is introduced by the finding that there was no correlation at all between marks obtained on the post-test and grades awarded for competence in teaching practice.

This brings to the fore one of the most urgent problems facing education today. What transfer is there from the sort of verbal understanding which enables a student to do well on a test or examination to the sorts of classroom situations that he is likely to meet in the practical task of being a teacher? If verbal material, no matter how it is presented, only provides students with suitable verbal labels to attach to abstract verbal situations, then the whole question of improving teacher competence requires critical investigation.

BOOK REVIEWS

BEARD, R. (1969). *An Outline of Piaget's Developmental Psychology.* London : Routledge and Kegan Paul, pp. 128, cloth 18s., paper 9s.

Dr. Beard's book is intended to meet the needs of students of education and practising teachers who wish to know more about Piaget's work but who find it too difficult or time-consuming to read much in the original. It tries, in the space of 30,000 words, to outline his theories of the development of children's thinking and to provide a representative sample of his observations and experiments. The enormity of this task can readily be appreciated from the fact that an attempt at the production of a comprehensive bibliography to mark Piaget's seventieth birthday in 1966, resulted in a list of nearly 500 items, without the authors being in any way certain that their coverage had been exhaustive. There has, also, been little indication of a diminution in his output during the last three years. It is greatly to Dr. Beard's credit that in the face of this embarrassment of riches and the severe space constraints she has produced a lucid, well-organised and surprisingly comprehensive account.

As befits the readership in view, the main focus of the exposition is Piaget's account of intellectual development. The entire theory is outlined in Chapter 1 and basic terms such as assimilation, accommodation, schemata and operations are defined. Succeeding chapters provide extended treatments of the sensori-motor period, the pre-conceptual and intuitive sub-stages, the sub-period of concrete operations and the period of formal operations. The strengths and weaknesses of children's performance at each stage are illustrated by quotations from Piaget's accounts of his own experiments and qualified by references to later experimental work. Children's linguistic, social and moral development as they impinge on intellectual performance are also covered. Each chapter ends with a brief discussion of the import of Piaget's ideas for the education of children in the given age range and the book concludes with a general consideration of the practical implications of Piaget's work for teachers.

Since the book is intended for non-specialists two points of detail which might produce misconceptions should, perhaps, be mentioned. From the way in which they are presented it would be possible for a naive reader to reach the erroneous conclusions that Luria's views on the role of language in intellectual development would be acceptable to Piaget and that Talyzina and Galperin's method of encouraging children to internalise principles is consistent with his position.

In view of the ' tour de force ' of compression performed by Dr. Beard, the mention of omissions seems uncharitable to say the least. A few lines might, however, have been profitably devoted to the work of Aebli, whose account of the import of Piaget's ideas for education has received the master's seal of approval, and also to the numerous experimental attempts to accelerate the course of intellectual development inspired by his work. The addition of a list of suggested further reading, including such items as the collections of papers edited by Ripple and Rockcastle, Sigel and Hooper, and Elkind and Flavell, might, also, have been of benefit to the more committed reader. In summary, however, the lasting impression is that Dr. Beard's ' Outline ' will prove to be a valuable addition to the burgeoning area of Piagetian literature. J. G. WALLACE.

ELKIND, D., and FLAVELL, J. H. (Ed.) (1969). *Studies in Cognitive Development.* London : Oxford University Press, pp. 503, cloth 84s., paper 38s.

This volume consists of 14 essays written in honour of Piaget. The first five, covering about half the book, deal with theoretical perspectives. McV. Hunt opens with a paper on the impact and limitations of the work of the Geneva School, comparing it with other schools of psychology, and looking at some of Piaget's basic notions underlying developmental adaptation. Flavell and Wohlwill follow with a study of certain aspects of the formal (the kinds of cognitive activities) and functional aspects of cognitive development from the standpoint of competence and performance models of modern psycholinguistics. They raise, and discuss, some very interesting questions. The third essay, by Pinard and Laurendeau, deals specifically with the 'stage' concept in Piaget's theory. They elaborate on criteria proposed by Piaget to characterise a stage, indicated here as hierarchisation, integration, consolidation, structuring and equilibration. There is also helpful comment on methods used to accelerate development and on the authenticity of acquisitions under such approaches.

Two shorter papers follow. Elkind compares the conception of a concept which is implicit in the discriminative response method of concept assessment with that implicit in Piaget's conservation problems, and concludes that they are complementary. In the second, Wallach asks what is meant by conservation under certain transformations and how children arrive at a solution to the conservation problem at all. After reviewing explanations suggested by others, she puts forward her own.

Of the eight papers dealing with research perspectives two are concerned specifically with the sensori-motor period. Bruner's problem is the process whereby the infant comes to relate the activity of one hand to that of another under the guidance of vision, while Burton L. White reports his findings relating to the schemas of looking, sucking and grasping. Using large numbers of infants he amply confirms Piaget's views on the reciprocal co-ordination between previously isolated schemas, although others of his findings diverge from those of Piaget.

Charlesworth examines the role of surprise in cognitive development, while Sinclair-de-Zwart gives a clear picture of the Geneva view of the role of language in cognitive growth, and then speculates on a theory of language acquisition written within a Piagetian framework. Beilin outlines the training procedures used in, and results obtained, from his conservation tasks and discusses the difficulties children have with them. The study of memory, in respect of recognition, reconstruction, and the evocation of particular events, and its relation to intellectual growth is dealt with by Inhelder; indeed she gives an overview of some of the Geneva findings presented in *Memory and Intelligence*. Pollack's paper handles perception. His considerable experimental work leads him to agree substantially with Piaget in respect of secondary (Type II) illusions although greater weight would be given to intellectual functioning, but not in respect of primary (Type I) phenomena. Finally, in this section there is a discussion by Goodnow on research problems in the area of culture and thinking, also on task difficulty as it relates to differences in milieu.

The last paper by Sigel stands on its own under the heading of applied perspectives. In this he argues that both teacher and curricula-builder can use Piaget's work as a conceptual framework inside which they can consider their problems.

This is an excellent series of essays which the serious student of cognitive development must read. There is a wide coverage of topics although, surprisingly, little is said about formal operational thought and its related problems. The editors, too, are to be congratulated on having done a good job of work. True, there are few small defects: for example, some items listed in the index do not include all the page numbers on which the items are found. But these points are minor ones. Here indeed is a progress report on work which was initiated by a great teacher.

K. LOVELL.

DALE, R. R. (1969). *Mixed or Single-sex Schools?* London: Routledge and Kegan Paul, pp. 272, 60s.

There are many questions in education of which it might be said that they are discussed more on the basis of emotion and prejudice than empirical evidence, This is certainly true of the co-educational / single-sex secondary school controversy. and it is noteworthy that the author of this book " after years of research . . . has failed to discover a single book, in any language, which presents any substantial *research* evidence on the subject." Empirical enquiry is therefore certainly welcome.

The question form of the title indicates that a judgment is to be made about co-education, and in this book the opinions of groups who have had experience of the two kinds of schools are presented—teachers, ex-pupils, and pupils. The subjects were obtained from staffs in colleges and departments of education, teachers in the grammar schools of one county, students (as ex-pupils) of colleges and departments of education, and pupils in grammar and single-sex schools, matched in social composition and selected by the Department of Education and Science and the LEA. The opinions of the subjects were assessed mainly from their reponses to group-administered questionnaires which posed questions of a fairly general nature. For example, the students were asked to rate the degree of happiness they associated with their life at school, and the extent to which they found the teachers friendly and helpful; while the staffs, after having various modes of school organisation defined for them, were asked to indicate which one they preferred. The dangers associated with this method of enquiry are well-known and the testing procedures are as adequate as resources would permit. Criticism might be levelled at the nature of the samples. Nevertheless, the consistency with which co-educational schools are rated more favourably than single-sex schools is impressive. Of particular interest are the views of teachers and ex-pupils who have had experience of both kinds of school.

For certain items, respondents' comments were sought on why they held the views they did. This was done in an open-ended way and the material treated qualitatively. The main reasons given by the teachers for their views were social and emotional rather than academic in nature. They felt that the development of pupils was fuller at co-educational schools and, as regards the schools, it was more frequently said of co-educational ones that the general atmosphere was brighter and more friendly.

This latter criterion of ' morale ' is an important aspect of group and organisational functioning, and the results of this initial report strongly suggest that a more systematic investigation of single-sex and co-educational schools, *per se*, would be well worth while. Following the teachers' comments, pupil-teacher and staff relationships, together with the way in which authority is exercised, would be crucial aspects of the study. If the study were mounted in such a way as to control organisational variables, it would then be possible to evaluate the relative contribution of psychological and social variables to any differences which might arise rather than merely to express opinions about their influence.

The other criterion employed by the teachers, the social development of the pupils, is an aspect of educational goal achievement which is amenable to independent assessment. The author reports that data are available in this area and promises a subsequent volume to deal with his findings.

He is well aware that evidence of such a nature is certainly more objective than that derived from opinion and subjective judgment. In one chapter, which is quite distinct from the remainder, he employs ' hard ' data to assess the extent to which tensions existing in various kinds of secondary schools are reflected in the premature retiral ages of female staff. The results are inconclusive and the difficulties of data collection and the small numbers involved are advanced as possible explanations.

As the present volume is the first of four dealing with the question posed in the title, it contains no definitive answer. Rather might it be regarded as an initial broad sweep across the problem area. The early findings certainly suggest that the question is well worth asking and that the later volumes reporting this work should be of considerable interest.

D S. FINLAYSON.

FREEMAN, J., BUTCHER, H. J., and CHRISTIE, T. (1968). *Creativity: A Selective Review of Research*. London: Society for Research into Higher Education, pp. iii+113, 21s.

This is an important book for its size—not least because of its 113 pages, some 40 are devoted to the bibliography. The authors begin by pointing to the muddle in creativity research, calling for a more detailed semantic analysis and perhaps an operational definition of the central concept. Notwithstanding these needs, they conclude that creativity research has stimulated a great deal of re-thinking about the limitations of traditional intelligence and attainment tests and perhaps also traditional educational procedures. They offer a framework for the study of creativity, on the basis of which their book is written. This framework allows them to classify research in terms of its subject matter, method of investigation and kind of theoretical approach. In this final category, the authors suggest that research into the nature of creativity can be classified into three main divisions : (i) concerned with intelligence and abilities, (ii) personality characteristics and (iii) education and training. This reviewer would add a fourth (although this addition might well be regarded as personal pleading for an area generally neglected in the literature which Freeman, Butcher and Christie are reviewing) : research into creativity against the background of the study of thinking or problem solving.

Having established a frame of reference, the authors proceed to a detailed review of the three major divisions, accompanied by a report of original research into the content of the special abilities found in creative architects. This original research hinges on the use of an ingenious performance-type test devised by J. G. M'Comisky. This is particularly relevant to architects in that it involves manipulation of three dimensional, spatial concepts. Major results draw a distinction between students of architecture on the one hand and economics and social science students on the other. The respective performance of the best and worst six students of architecture are then compared in detail. The chapter makes interesting reading, but the problem is that research of this kind tends to be somewhat circular, hinging as it does on the acceptance of the criterion classification of subjects being valid. Even if one accepts the validity of the criterion, one might ask what the results do mean unless performance on the creativity test is related to other factors.

The review chapters on " Creativity as related to intelligence and personality " and " Special abilities in Creativity " are excellent, as is the final section on " Creativity and environment." The chapter on educational factors in creativity has somewhat less impact, perhaps because, as the authors themselves say, " studies of the development of creativity have been, in general, much more tentative, desultory and inconclusive than the studies which have been primarily concerned with the establishment of what we have termed the special abilities and personality characteristics of creative individuals." Indeed, in the final chapter and in particular in the section on " The School Environment " we learn most about the influence of educational factors on the development of creativity.

This reviewer strongly recommends this little book to all those interested in creativity and creativity research. However, while recommending the book for its content and matter, one must find fault with its physical make-up. This is not a cheap paper-back and yet, before the book had been read once, it had disintegrated into more than a hundred loose leaves ! GEORGE SHOUKSMITH.

HOPE, K. (1969). *Methods of Multivariate Analysis.* London : University Press, pp. 288, 63s.

This useful little book aims at giving psychologists an understanding of the following multivariate techniques : analysis of variance and covariance, together with multiple regression ; discriminant function ; principal component analysis. The only mention of factor analysis is a brief inclusion in a discussion on principal component analysis.

The emphasis is placed on what the analysis does rather than on its derivation, and on the interpretation of the results rather than on their calculation. Such an approach leads to a simplification of the material and a clear introduction to unfamiliar concepts. The examples are psychological in form and imply some knowledge of matrix algebra and elementary statistics. To deal with the former requirement a chapter on matrix methods is added, but a reader with no previous acquaintance with the topic might well experience some difficulty.

The hard cover edition is accompanied by a *Handbook of Multivariate Methods Programmed in Atlas Autocode*. The usefulness of this is limited to the reader who is going to use the author's programmes. This section merely explains how the data from the examples in the main part of the text should be input for these particular programmes and what form the output would take.

No description or flow diagrams of the programmes are provided. However valuable the programmes are, and they look very comprehensive, similar programmes exist, often in more widely used languages. Some users may prefer to use their own or, if the analysis is not too complicated, to do it by hand or by calculating machine. Indeed, there exist a great many students and others who would benefit by reading the first half of this book but who might never have cause to use the techniques themselves. A knowledge of the main text should help the understanding of much current research.

To sum up, this book provides a refreshing change from the " computation handbook " approach which emphasises calculation. It lays stress on the purpose and nature of each of the types of analysis covered. The question of the appropriateness of a technique to a particular problem is one to which many students and research workers could profitably give more attention. R. R. MACDONALD.

KAY, W. (1968). *Moral Development.* London: Allen and Unwin, pp. 270, cloth 48s., paper, 28s.

The publisher's claim that Mr. Kay's book " offers a complete description of the moral growth of children from infancy to adolescence " is not completely justified. The book does, however, provide its intended audience of 'students and practising teachers' with a readable introduction to a selection of studies of verbalised morality. The book is to be recommended, as John Wilson implies in his foreword, at least as much for inspiration as for information. It has a spirit of crusading zeal for the cause of moral education to which even the most cynical reader will respond. The book's best chapters are those on " The Nature of Human Development," " The Theory of Recapitulation " and " Moral Education."

The limitations of this book are the limitations of verbalised morality as a predictive measure. Although Mr. Kay regards the translation of " the 'should' of human experience " into " the 'would' of human behaviour " as the central problem of moral education, he omits any mention of the long and depressing literature establishing that moral (or immoral) behaviour can best be predicted by non-moral verbal measures rather than moral verbal ones. Bearing this in mind, it would have been useful to at least look at the behavioural side of the coin. For example, sexual behaviour deserves a place in a book on morality aimed at teachers. Even within Kay's selected field of verbalised morality there are some notable omissions. Turiel's work on moral teaching would have been very relevant, as would Aronfreed's on guilt expression.

In addition, there is the problem involved in defining precisely what moral maturity is like. Kay succeeds in this at least as well as the writers he quotes. He does occasionally retreat into the mysterious, however. To take an example from his description of younger children: " Spontaneous morality may appear to be both natural and yet unnatural for the very young. This explains the moral ambivalence of the very young child " (p. 155). There is also not really enough detail in Kay's report of his own research. Its value cannot be assessed on the basis of this, presumably the only published, account.

Basically, this is a book which is to be recommended despite various irritating features, such as the spasmodic use of two different methods of giving references.

KENNETH PEASE.

LOVELL, K. (1968). *An Introduction to Human Development.*
O'CONNOR, K. (1968). *Learning: An Introduction.*
MUSGRAVE, P. W. (1968). *The School as an Organisation.*
LANGFORD, G. (1968). *Philosophy and Education.*
APTER, M. J. (1968). *The New Technology of Education.*
FIRTH, B. (1968). *Mass Media in the Classroom.*
London: Macmillan, cloth 25s., paper 12s. 6d. each.

The six books reviewed here are the first of a series designed for students in colleges of education and university education departments, and for practising teachers. The series includes " Background books," the first four in the list above, which are designed to provide a basic introduction to particular areas, and " Topic books," the last two above, which aim to offer "elementary but authoritative guides to specialised fields of teaching." Each book consists of approximately 120 pages divided into seven chapters, has an index, a bibliography and a list of further reading; most of the authors also provide a summary of each chapter, references and a glossary of technical terms.

The four basic books reviewed here vary considerably in the amount of information they contain and in level of difficulty. *An Introduction to Human Development* deals with the subject matter by topic, for example the development of thinking, language and so on, rather than by ages and this makes for easier reading. The author has selected that approach which he considers most useful to the teacher; thus concept development is dealt with from a Piagetian viewpoint only. There is a very good summary of the difficult area of parent-child interaction and the effect of this on the child's personality. There are some interesting omissions such as the development of intelligence. The book suffers from over-condensation and from lack of diagrams, particularly in the first chapter; it is, however, an interesting introduction to the areas it covers.

The book on learning gives a lively introduction to a Hebbian biological approach. There is a brief look at experimental method though this does not include anything on measurement. There are sections on imprinting, habituation and maturation. As might be expected within this framework the chapter on motivation is particularly good on exploration. The traditional areas of retention and transfer are covered. The examples and anecdotes are pertinent and familiar to students and there is an attempt to relate the topics covered to teaching. The selection of material does not appear to this reviewer to be the most useful for teachers and student teachers. The recent mass of work on verbal and cognitive learning which has some relevance to classroom learning is omitted.

The School as an Organisation is a very easily read introduction to a new and fashionable area. It deals with the roles of the teacher, head teacher and pupil from a sociological viewpoint, and there is some discussion of goals. Just how recent is this area is illustrated by the small number of references, almost all from the present decade. Students should be encouraged to read this book alongside a study of *Philosophy and Education*, particularly when considering such topics as role and responsibility where there is considerable overlap. The latter is a much more difficult book and requires students to think and consider in such areas as, for example, the aims of education and the language and concepts used to describe the educational process.

The two topic books, *Mass Media in the Classoom* and *The New Technology of Education*, are both sound descriptive introductions to their subject matters. The first of these devotes chapters to the mass media, newspapers, magazines, television, advertising, film and is essentially a methods book providing as it does many suggestions for classroom work. Why is pop music omitted? Apter's book provides a factual, up-to-date description of the various technological aids now available to the teacher and ranges from CCTU, programmed learning, language laboratories to number and reading apparatus.

At a time when almost all American books are outpriced for student teachers a home-produced series should have a clear advantage. As hardbacks this particular series is too expensive for the slender amount of content possible in 120 pages;

as cheaper paperbacks some of the series seem to fulfil a genuine need, particularly where the subject matter is not easily available elsewhere. When a book in this series closely parallels an obvious alternative, the alternative is usually cheaper, contains considerably more information and illustrations, and, therefore, gives a wider coverage of the topic. As the books were put out as a series some cross referencing, for example of concepts as discussed by Langford, Lovell and O'Connor, might have been helpful. JOAN TAYLOR.

MCFARLAND, H. (1969). *Human Learning: A Developmental Analysis.* London: Routledge and Kegan Paul, pp. 128, cloth 16s., paper 8s.

This is a short but comprehensive introduction to the study of human learning, written primarily for students in colleges of education. The opening chapter takes a student-centred approach, and points out five aspects of student learning: the learner himself, in the various ways he conceives himself and is seen by others; the ways in which the activities involved in learning vary from subject to subject; the ' atmospheric effects ' of the institution at which he is studying; the way the student is taught, noting also that a system of assessment may be almost a teaching method in itself; and the student's own techniques of study.

This introduction sets the tone of the book, which is not so much a book on the psychology of human learning as an analysis of the topic from many viewpoints such as the behaviourist, the configurationist, the psycho-analytical, the sociological and the empirical. Some of these headings are used in the next three chapters, which deal in turn with pre-school, primary, and secondary school learning. In the fifth and last chapter, entitled " Some learning problems," the author points out again that " there is no justification for assuming that the analysis of learning should ever be strikingly simple or non-technical." Suggestions are offered for further study—in some cases, one might think a lifetime of study: e.g., " What is the relative importance of psychological, sociological, historical, economic, political or cultural factors in explaining different analyses of learning? "

While dealing fairly, in the space available, with the differing psychological viewpoints mentioned earlier, the author does not give them first importance as guides for the prospective teacher. For example (p. 97) " . . . what is vaguely called the teacher's ' personality ' is longest remembered when everything else is ' forgotten ' . . . " And in his outline of an imaginery ideal secondary school (p.100): " The tone set by teachers and parents, the guidance programme, the social life of the school, . . . the adolescent-centred, life-centred, and yet tradition-enriched curricula and syllabuses, the emphasis on learning through pupil activity with teacher guidance—these *are* the teaching and learning methods."

It has unfortunately long been the case that ' learning ' has one set of connotations for many academic psychologists, and another for those whose profession it is to guide and help human learning. The present volume shows just how wide the gap still is, while indicating many points at which bridge-building might usefully be done. Although it is unfortunately not true that " a problem clearly stated is half answered," at least here it has been well and clearly stated. RICHARD SKEMP.

MITTLER, P. J. (Ed.) (1968). *Aspects of Autism: Some Approaches to Childhood Psychoses.* London: British Psychological Society, pp. 89, 10s.

This BPS publication gives an account of the proceedings of a conference on childhood psychoses organized jointly by the Division of Clinical Psychology and the Division of Educational and Child Psychology. The proceedings are not overlong, and it is not surprising if, at a time when the number of books which simply must be read increases almost daily, a reasonably brief publication induces a favourable set in a reviewer. This favourable set was maintained throughout the first three of the six papers. Michael Rutter provides an excellent opening contribution, cautiously and concisely discussing the various theories of autism propounded to date. Even if he does not add much that is new, he clarifies the concepts in vogue, and although he may not take us very far with his hypothesis that the primary problem in autism is one of language or coding, his paper is a first-rate introduction to a complex subject.

Next, Beate Hermelin describes some interesting experiments on the immediate memory functioning of a number of autistic children who had some speech—an account which would have been enhanced by the inclusion of greater detail about the sample of children tested. The third paper, by Peter Mittler, is a lucid introduction to the problems of assessing autistic children, in which he rightly emphasises that the psychologist should be primarily concerned with probing the child's learning disability rather than with giving him a label.

The high standard of these three papers is not maintained in the sections on the contribution of education and psychotherapy to helping psychotic children. Miss Clark's paper on educational treatment contains some wise observations, but is rather thin: it tends to underestimate how much a skilled teacher, who spends a good deal of time with a child, can contribute to diagnosis and to overestimate the ease with which a personal relationship can be made with autistic children. The paper by Dr. Stroh on psychotherapy is also insubstantial and, in the main, not relevant to autistic children. The final section by Dr. Fischer on behaviour therapy is an interesting one, encouraging the reader to explore this approach further through the references given; and there is a valuable appendix by Lorna and J. K. Wing, giving a systematic and detailed description of the behavioural characteristics and handicaps of autistic children.

Most published accounts of conference proceedings are uneven and this one is no exception. It is, however, easy to read and provides an up-to-date introduction to the study of autism which will be particularly useful for students. M. CHAZAN.

MUSGROVE, F., and TAYLOR, P. H. (1969). *Society and the Teachers' Role.* London: Routledge and Kegan Paul, pp. 104, 21s.

This short book is both provocative and provoking. The opening sentences set the tone: "During the last hundred years there has grown up in our midst a new despotism: the rule of the teachers. Today they claim to decide what kind of people we shall be." These statements are supported by quotations from various educational policy documents from 1868 up to 1963. This new despotism is seen as replacing the despotism of parents which was described in Musgrove's previous book, *The Family, Education and Society* (1966).

The chapter titles indicate the tone of the book: "The Expectations of Pupils," "The Expectations of Parents," "Parents *versus* Teachers" "Teachers' Role Conflicts," and "Problems of Status and Role." The seventh and final chapter indicates what the authors think the teachers' role ought to be: "Teachers and Clients." They suggest ways in which the monopolistic despotism of a state educational system can be broken, and both privilege and deprivation abolished.

Brief discussions of the topics of each chapter are supported by the results of enquiries carried out among junior, secondary modern and grammar school children, and among groups of teachers in the same sorts of schools. Short 'scales' consisting of statements about the behaviour of a good teacher were made up from essays on 'A Good Teacher,' written by 1,379 school children. The scale most used by the authors consisted of six statements, two relating to each of teaching, discipline and personality, the last being personal qualities of sympathy, understanding and sense of humour. These statements were ranked in order from 1 to 6 by groups of children and by teachers. From the results (the statistical treatment of which seems questionable), it appeared that the children both in junior and in secondary schools valued the teaching skill of their teachers. Some, but not all of the groups of teachers put this first, but teachers tended to make personality more important than teaching.

Chapters three and five both report investigations into what parents expect school teachers to do for their children. Some quite interesting social class and area differences are shown. Most parents value mainly a teacher's ability to teach, but working-class parents put more emphasis on social training than middle class parents do. Teachers were also asked to rank their aims, first, as they valued them, and second, as they thought parents valued them. The results were interesting Parents and teachers agreed closely; much the same percentages put 'moral training' and 'instruction' in first or second place, but the teachers thought that more parents would put 'social advancement' in first or second place, and that very few would put 'moral training' high. This seems an important result, and one worth much more investigation.

Teachers' role conflicts are investigated in a similar sort of way. Teachers were asked to rank four sorts of statements about teachers' functions (teaching, discipline personality and organisation) from several points of view, described as actual and ideal self, and as the headmaster, colleagues, parents and pupils would rank them. (The authors seem not to have heard of the mechanism of projection.) Simple histograms present the most convincing evidence that teachers see their own values as being at odds with those they attribute to the headmaster and to their pupils. The more elaborate statistical treatment using the cofficient of concordance is difficult to follow, and does not seem justified by the nature of the data.

There are some interesting notions in this book and some promising lines for research. Finding out what children want from their teachers, and what parents want; coupling this with an attempt to find out what teachers think pupils and parents want, and showing the discrepancy between these 'perceived expectations' and the actual expectations of pupils and parents seems to me both original and important. What worries this reviewer is that the scales used are all very short, and there is no information about their reliability. The sampling of teachers seems inadequate, in spite of the fairly large numbers. The statistical treatment seems, sometimes at least, inappropriate to the data. Looking up the papers by Musgrove and Taylor, severally or jointly, in the *BJEP*, one finds that these have been reproduced almost exactly in the present book, with bits added at the beginning and end of the chapters to help the transition from one to the other. A straightforward collection of reprinted papers with fuller discussion of the implications of the combined results might have been more satisfactory. This could have been a very important book; instead it is only, in all senses of the word, provocative.

AGNES CRAWFORD.

PETERS, R. S. (Ed.) (1969). *Perspectives on Plowden*. London: Routledge and Kegan Paul, pp. x+106, 16s.

The 1967 Plowden Report on *Children and Their Primary Schools* asserted the need for teachers to bring an 'astringent intellectual scrutiny' to bear on their day-to-day problems. The 100-page *Perspectives on Plowden* edited by Professor Peters brings just such a much needed scrutiny to bear on the 1,100-page report itself. The Plowden Committee "invited the help of a number of distinguished educationists and professors of educational philosophy" all of whom, apparently, "confirmed the view that general statements of aims were of limited value, and that a pragmatic approach to the purposes of education was more likely to be fruitful." And yet, on their London doorstep one might say, the contributors to the present volume—Peters, Dearden, Foss, Bernstein, Davies, and Elvin—were there, available presumably to help Plowden along the straight and narrow path of philosophical, psychological, sociological, and educational rectitude. But, if having Professor Ayer on the Plowden Committee did not secure philosophical rigour, perhaps is it too much to hope that anything else might have done so.

What kinds of thing do Peters and his colleagues take exception to? Talking about children's development or needs as if these were phenomena independent of educational evaluation, selection and shaping. Emphasising concepts like self-direction, 'creativeness,' discovery, and 'integration' without sufficient regard to what precisely they mean and how they are related to historically and socially established values and forms of knowledge. Advocating religious education in a manner which thoroughly confuses learning about religion as a phenomenon and indoctrination in a specific religion. Counting the existence of wide public approval as a valid argument in the case of religious education but not apparently in that of corporal punishment. Exaggerating the relevance to human learning of the phenomenon of imprinting manifested in animals. Emphasising biologically conceived developmental stages rather than subcultural differences, socially determined. Confusing statements of fact, intention and disposition within the concept of 'attitude' and not recognising the association of such factors with social class. Reading causality into the correlation between parental interest and school attainment. Failing to go deeply enough into the sociology of the school, particularly "the extent and function of habit, types and ideology in schools" and the career patterns of teachers. These are some of the points of attack. The question has been put whether it matters that argumentation relating to such a practical process as education should be what one reviewer of Peters has called 'academically top-drawer.'

While one can sympathise with the educational practitioner who must often cut through the Gordian knots of argument in the face of practical necessities, the same man as educational theorist must argue to top-drawer standards if he takes his own arguments seriously and expects others to do likewise. Peters makes clear that he and his co-authors are not attacking the Plowden recommendations. What does concern them is that Plowden, with its 'unusual amount of educational theorising' despite its alleged pragmatism, may become a new College of Education Bible. And one can, indeed, imagine it perpetuating the unthinking 'child-centredness' that is already the soft fruit of some students' educational studies. *Perspectives on Plowden*, with R. F. Dearden's *The Philosophy of Primary Education* in the same series, should help to stimulate clearer thinking and encourage students to use 'children' as one, but not the only, magic word in the study and practice of education.

Foss's chapter on some psychological aspects of Plowden is relatively short and slight; the philosphers and sociologists get the bigger crack of the whip. On the little-fleas-have-littler-fleas principle, one could, of course, quibble about the critics themselves. One knows what Peters means when he says that "educational theory has been too much bedevilled in the past by slogans and causes," but students might still with profit analyse the serious place of slogans and causes in education and other studies, including literature and science. The current sporting world might cause one to reflect questioningly upon Elvin's dictum that our classic embodiment of the idea of fairness is on the games field. Dearden's outline of the aims of primary education invites discussion. But, principally, one must recognise the Peters volume as a neat critical review of some of the main questions of educational theory raised or ignored by the Plowden Report. H. S. N. McFarland.

Pidgeon, D., and Yates, A. (1968). *An Introduction to Educational Measurement*. London: Routledge and Kegan Paul, pp. 117, 16s.

As well as providing an introduction to the principles and practice of educational measurement, the authors of this recent addition to the 'Students' Library of Education' have incorporated a useful discussion of the role of assessment in the educational process. Teaching and examining should not be regarded as separate functions, but rather the discipline, to both teacher and taught, of involvement in examinations, should complement the process of instruction and help to increase its efficiency.

A main thesis of the book is that teachers should be acquainted with the basic techniques used in educational measurement, and that the acquisition of the appropriate knowledge and skills should form a normal part of a teacher's profesional training. The reasons advanced by the authors in support of this view includes the importance, especially with regard to educational guidance, of improving the efficiency of internal school assessments, the increasing degree of participation of teachers in 'external' examining and in research projects, and the need for teachers to be equipped to evaluate the findings of educational research. Two levels of training in the field of educational measurement are envisaged: every teacher should have some understanding of the principles of educational measurement, while a minority, perhaps one or two in every school, should become experts.

The book is clearly aimed at the general mass of students rather than at the potential experts. The topics covered include the nature of measurement, the design of examinations, item analysis, reliability and validity, the statistical treatment and interpretation of marks, correlation, sampling and errors of measurement, statistical significance, the structure of abilities and methods of moderating school-based examinations. As this list suggests, the authors have ranged widely in their choice of material; an unfortunate outcome is that, within a comparatively slim volume, it has not been possible to treat a number of important aspects of the subject with the thoroughness they deserve. Since the book is intended as an *introduction*, this may seem a carping criticism; but the usefulness of the book as a practical guide for the beginner could have been increased by omitting some of the more esoteric topics altogether and treating the more practical issues which affect teachers in their day-to-day work, in more detail. Minor irritations are the lack of an index (although there is a fairly detailed table of contents), a number of uncorrected printers' errors, and the frequent, and entirely unnecessary, recurrence of the phrases 'so to speak' and 'as it were.'

The book could, however, serve as a useful primer. The student who does not progress to the list of suggestions for further reading is likely to run into difficulties in trying to put the principles into practice, but he should at least have started to think along the right lines. J. W. STARR.

ROTHNEY, J. W. M. (1968). *Methods of Studying the Individual Child: The Psychological Case Study*. Massachusetts: Blaisdell Publ. Co., pp. 140, $1.95.

This American paperback is one of a series called *Topics in Educational Psychology*, written for teachers as well as school counsellors and others who are likely to use detailed case studies in their training. It covers the relevant techniques and problems with characteristic American thoroughness, but also with a welcome if uninspired awareness of the difficulties and limitations involved.

These case studies are intended mainly for educational guidance rather than clinical diagnosis. The reader is advised to collect data from as many sources as possible; testing, interviews, observations, ratings, self-ratings and questionnaires are discussed in detail. There is a useful emphasis on the importance of cultural differences and previous history, although value judgments about achievement motivation and 'good' co-operative parents have not been entirely avoided in the examples given. The unique complexity of the individual is stressed, to counter any tendency students may have to generalise too confidently from limited information. Unfortunately, the complexity acknowledged is external complexity and is not translated into an awareness of the perception children may themselves have of a situation.

One chapter is devoted to the often neglected details of actually writing up a case study. The author provides 20 questions about relevance, statistical data, family background, bases for predictions, the avoidance of 'censorial terms,' brevity and so on. It is disappointing, therefore, to find that the last quarter of the book consists of four very long sample case studies which do not come up to the author's own standards. Descriptive statements about children's background and behaviour are made in such an objective, dead-pan manner, and interpretations relating one event to another are so studiously avoided, that the studies are often not only dull but lacking in purpose. The relevance of some observations is not clear and the apparent significance of others not underlined.

Nevertheless, the book could be usefully added to an introductory reading list on courses for experienced teachers or school counsellors. EVA HOLMES.

THOMAS, A., CHESS, S., and BIRCH, H. G. (1968). *Temperament and Behaviour Disorders in Children.* New York: New York University Press, and London: University of London Press, pp. 309, 63s.

This is the second book based on the New York longitudinal study, begun in 1956, of 136 children from birth onwards. The first report, *Behavioural Individuality in Early Childhood,* appeared in 1966 and covered the first two years of life. The present volume carries the study up to age 9–10. The research is meantime showing all the healthy financial backing and publication output that suggests long continuance, at least to the stage of the early maturity of the subjects, and in this reviewer's opinion it promises to be as significant a contribution to the field of child development and personality study as were the earlier genetic studies of Terman and his co-workers.

The book benefits from, but is not dependent on, a knowledge of the first report. The central aims of the earlier report were, first, the objective definition of temperamental characteristics in children; and, second, the delineation of the contributions which such characteristics make to the development of behaviour, normal and abnormal. The overall conclusion reached was that certain personality characteristics *are* identifiable during the first six months of life and remain good predictors of behaviour over the remaining 18 months of the two-year period under study. In this second volume, while the general underlying theme remains that of the first report, the primary concern is with the 42 of the original 136 children who developed disturbances of behaviour of one kind or another (the 'Clinical Sample,' described in detail in text and tabulation in Chapter 3).

A wealth of case material is provided, almost too much: Appendix B, a third of the total pages, consists of *four* illustrative cases, with case summaries and selected extracts from the longitudinal records. Why four? For many readers, however, this may seem the most interesting and significant aspect of the report, showing as it does how disturbed behaviour—long before it was recognised as such—first manifested itself, how it developed and what responses it called forth from parents, teachers and others. Here we have an objective account of clinical cases whose past histories were actually known in fine detail and did not have to be inferred later by the clinician.

The greater part of the book is devoted to a detailed account of the analysis of the data, two complementary types of analysis being employed. The analysis, we should expect from knowledge of the first report, comes out strongly in support of the view of the direct relevance—as a significant influencing variable—of temperamental factors to the genesis and evolution of behaviour disorders. The authors, in this report as in the first, put considerable stress on the notion of *interaction* of variables: not temperament alone, not environment alone, but temperament-environment interactions are seen as underlying the development of both normal and abnormal behaviour. " The same motive, the same adaptive technique, or the same structure of objective environment will have different functional meaning in accordance with the temperamental style of the given child."

The last chapter deals with the practical implications for the psychiatrist and parent and teacher of such an interpretation. A significant section of the chapter goes under the heading, " Parent Guidance," clearly an interest close to the authors' heart. (We are promised in a footnote a forthcoming volume on just this subject.) The emphasis here is on the need to appreciate the child's individuality and to adapt one's behaviour accordingly: the notion of 'goodness-of-fit,' that what works with one child may not work with another, even within a family.

Like the earlier one this book has considerable theoretical importance, clinical interest and a practical 'message' for those involved in whatever way in child-rearing. Its successors are assured of an interested public. LORNA N. SIMPSON.

VERNON, P. E. (1969). *Intelligence and Cultural Environment.* London: Methuen, pp. vii+252, 45s.

'Comprehensive,' 'fair,' 'scholarly' and 'sane' were the recurrent terms which came to mind in the first appraisal of this book. Psychology is again in debt to Professor Philip Vernon for a book that very much needed writing. Its scope is very wide, ranging from "Current Conceptions of Intelligence" and "Factors Influencing the Mental Development of Children" (Parts I and II) to more specifically cross-cultural problems—"The Application of Tests in non-Western Cultures," "Studies in Britain" and "Cross-Cultural Studies" (Parts III, IV and V). The author's definition of 'Intelligence' is so comprehensive that we have lucid analyses and discussions of such varied topics as the effects of sudden weaning on African babies, Witkin's work on field-independence, and the implications of visual discrimination studies among Eskimo !

On the "Nature *versus* Nurture" controversy the author is not afraid, unlike many well-meaning and relatively naive commentators, to state *possible* genetic factors in group differences in abilities. It is refreshing to see human differences stressed, rather than the rather dull assumptions of "Neo-natal equivalence and equipotentiality."

Much of the work reported has been done by the author himself, and this adds 'knowledge of acquaintance,' as against 'knowledge about' to its impact in the cross-cultural field. In a second edition, one would wish for more data on the attitudes to the tester and test situation of subjects from various cultures. Reading this book, this reviewer was vividly reminded of his single attempt to test an elderly, illiterate, rural, Zulu on a Porteus maze. It was carefully explained to the old man that it was a picture of a cattle kraal and that the object was to get a cow (hypothetical) into it. "Any man," he said, with some sympathy and great courtesy, "who designed a cattle kraal like that, is mad."

The book should be required reading for all undergraduate students of psychology, education and allied disciplines. The research-worker in the cross-cultural field will find it indispensable. S. G. LEE.

WIERSMA, W. (1969). *Research Methods in Education: An Introduction.* Philadelphia: J. B. Lippincott Company, pp. 412, $6.95.

The subtitle, *an introduction*, suggests that this book is aimed at beginners in educational research, but study of the contents leads to the conclusion that this is not so. It is not a book for the naive student, but rather for those of greater educational experience wishing to understand or carry out serious research.

The emphasis throughout is on systematic planning and the use of scientific methods. The author insists that hypotheses should be formulated carefully and experimental work designed to test them adequately. "The design is conceived prior to experimentation and should be carefully applied. There are no post-experiment manipulations, statistical or otherwise, that can take the place of a well-conceived experimental design" (p. 253). Embryo researchers might, with advantage, commit that to memory.

Three important chapters deal with parametric, non-parametric and correlational techniques for testing hypotheses. The inclusion of non-parametric techniques greatly enhances the usefulness of the work, and this and an early discussion of nominal, ordinal, interval and ratio scales should prevent the reader from imputing a spurious degree of accuracy to educational measures.

The necessity for basing conclusions on existing information is stressed. "It behoves researchers to have evidence about the facts of a situation before an attempt is made to explain the situation. Otherwise the researcher runs an additional risk of trying to explain a situation which does not even exist . . . Conjecturing about the interpretations is tenuous enough without conjecturing about the results" (p. 262).

The discussion of statistical methods is confined to elucidating underlying principles. In the age of the computer, this is sound. Learning computational methods appropriate to the age of steam is now a waste of time, which is much better spent on ensuring that theory will bear investigation.

A chapter on non-experimental research contains a section on sampling, which should bring home to students the importance of this process. Brief sections on survey methods and historical research make plain that these, too, are recognised as research.

Sets of suggested study exercises at the ends of chapters could be used as a basis for class discussions or written work, making the book a good adjunct to a lecture course. One appendix contains solutions to the exercises and another contains useful references, including the *BJEP* and the *British Journal of Educational Studies*.

This is a welcome addition to the teaching literature on educational research. It is full of good advice and sound sense, nicely calculated to save unwary researchers from digging pits and themselves falling therein. K. M. Evans.

PUBLICATIONS RECEIVED

Books for review have been selected from the following. The date of publication is 1969 unless otherwise stated. " n.p." means " no price stated."

Ablewhite, R. C. *Mathematics and the Less Able.* London : Heinemann, pp. 98, 16s.

Alexander, T. *Children and Adolescents.* New York : Atherton Press, pp. 365, $8·95.

Bernard, H., and Fullmer, D. *Principles of Guidance,* London : International Texts, pp. 399, n.p.

Bettelheim, B. *The Children of the Dream.* London : Thomas and Hudson, pp. 363, 50s.

Biesheuvel, S. *Methods for the Measurement of Psychological Performance.* Oxford: Blackwell, pp. 98, 20s.

Bowlby, J. *Attachment and Loss. Volume I—Attachment.* London : Hogarth Press, pp. 428, 63s.

Bresson, F., and Montmollin, M. *La Recherche en Enseignement Programme.* Paris : Dunod, pp. 360, 78F.

Cullen, C. *School and Family.* Dublin : Gill and Macmillan, pp. 192, 30s.

Downie, R. S., and Telfer, E. *Respect for Reasons.* London : Allen and Unwin, pp. 165, 40s.

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Evans, E. G. S. *Modern Educational Psychology : A Historical Introduction.* London : Routledge and Kegan Paul, pp. 110, c. 18s., p. 9s.

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Morrison, A., and McIntyre, D. *Teachers and Teaching.* London : Penguin, pp. 206, 6s.

Nisbet, J. D., and Entwistle, N. J. *The Transition to Secondary Education.* London : University Press, pp. 115, 25s.

Piaget, J. *The Mechanisms of Perception.* London : Routledge and Kegan Paul. pp. 384, 80s.

Pietrasinski, Z. *The Art of Learning.* Oxford : Pergamon, pp. 138, 60s.

Pietrasinski, Z. *The Psychology of Efficient Thinking.* Oxford : Pergamon, pp. 202, 60s.

RICHARDSON, A. *Mental Imagery*. London: Routledge and Kegan Paul, pp. 180, 35s.
RICHARDSON, H. *Adolescent Girls in Approved Schools*. London: Routledge and Kegan Paul, pp. 297, 60s.
SAWIN, E. *Evaluation and the Work of the Teacher*. California: Wadsworth, pp. 298 n.p.
SCHOFIELD, H. *Latin by Stave Analysis*. Reading: Educational Explorers, Ltd., pp. 95, 30s.
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WILLIAMS, N. *Child Development*. London: Heinemann, pp. 110, 7s. 6d.
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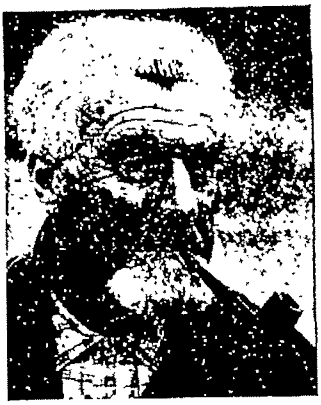
WRIGHT, G. (Ed.) (1968). *Wisconsin Studies in Vocational Rehabilitation*. Wisconsin: University Press, pp. 273, n.p.

Studies in Animal and Human Behaviour Volume 1

Konrad Lorenz



The first volume of Konrad Lorenz's Collected Papers contains six papers published between 1931 and 1942 :
Contributions to the study of the ethology of social Corvidae (1931) ; *A consideration of methods of identification of species-specific instinctive behaviour patterns in birds* (1932) ; *Companions as factors in the bird's environment* (1935) ; *The establishment of the instinct concept* (1938) ; *Taxis and instinctive behaviour pattern in egg-rolling by the Greylag goose* (1938) ; *Inductive and teleological psychology* (1942).

'All serious students of animal and human behaviour will want to read these early papers by a man of original genius who laid the foundations of modern ethological thought.'
Anthony Storr, *The Sunday Times*. 80s net

Coming in March/April

Methuen's Manuals of Modern Psychology :

The Structure of Human Personality Third Edition

H. J. Eysenck

For this third edition many corrections have been made, a new chapter on *Causal Theories of Personality Structure*, and several illustrations have been added
55s net University Paperback 25s net

An Introduction to the Psychology of Language

Peter Herriot

A survey of psychological studies of language for advanced students of psychology. The author stresses throughout the necessity for empirical research and for experimental verification of hypotheses. He also feels that language behaviour should be analysed in a comprehensive form, placing emphasis not only on structural aspects but also on the importance of meaning and context to any account of language. 55s net

METHUEN

The Psychology of the Child

JEAN PIAGET and BÄRBEL INHELDER

respectively Professor of Experimental Psychology and Epistemology and Professor of Developmental Psychology, University of Geneva

Translated from the French by Helen Weaver

A definitive presentation of the developmental psychology Professor Piaget has elaborated over the last forty years. The book provides a profound and authoritative synthesis of his child psychology, and traces the stages of cognitive development over the entire period of childhood from infancy to adolescence. 35s

The Child's Conception of Time

JEAN PIAGET

Translated from the French by A. J. Pomerans

Is our intuitive grasp of time primitive or derived ? Is it identical with our intuitive grasp of velocity ? What bearing do these questions have on the genesis and development of the child's conception of time ? Here Professor Piaget and his collaborators examine these questions. They discuss the problems of duration and temporal succession by applying the idea of groupings to the development of the child's conceptions of motion, velocity and time. 45s

Personality Structure and Measurement

HANS J. EYSENCK and SYBIL B. G. EYSENCK

respectively Professor and Senior Lecturer, Department of Psychology, Institute of Psychiatry, University of London

The book begins with a statement of the principles of typological research in psychology. The second part describes several large-scale studies using personality questionnaires prepared by the authors as well as the standard ones of Cattell and Guilford. The third section deals with personality structure changes with increasing age and a comparison of the personality structure of men and women. The results of these investigations direct new light on the structure of the personality and cast doubt on many widely accepted findings. *Illustrated* 70s

Moral Judgement from Childhood to Adolescence

NORMAN J. BULL

Principal Lecturer and Head of Religious Department, St. Luke's College of Education, Exeter

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YOUNG CHILDREN IN TRAFFIC

BY STINA SANDELS

(*Research Institute of Child Psychology, School of Education, Stockholm*)

Traffic accident statistics in various countries show that young children are one of the age groups which are most affected, both as pedestrians and as cyclists. In Sweden, when accidents involving children are discussed it is often said that these accidents are caused by children's carelessness, incautiousness and rashness. Such points of view are put forward in verdicts in traffic cases in which children have been involved. It would seem that young children are regarded in approximately the same way as ordinary adults, and held responsible for their incorrect behaviour. Similarly, this identification of children with adults has produced the belief that the behaviour of young children in traffic could be made perfect by instruction, and demands for this have often been raised in some quarters in the name of accident prevention.

But what happens if children are too immature to be able to derive any benefit from traffic instruction? What can be regarded as 'normal' behaviour in traffic for children of different ages? The Research Institute of Child Psychology at the University of Stockholm has, since 1960, been carrying on a series of investigations dealing with traffic maturity in children. These investigations are still incomplete but an account of them has been given in a book entitled *Young Children in Traffic* (in Swedish) published by Läromedelsförlagen, Stockholm, 1968. This paper gives a summary of the book.

A start was made with a survey of *Young children's play habits and ranges of action in modern urban areas.* This survey took the form of a series of exploratory studies, carried out by the Institute in conjunction with the Department of Town Planning at the University College of Technology, Stockholm:

(*a*) A study of young children (of pre-school age), their play habits out-of-doors, and the number of times they went in and out alone with a play group or with an adult through the door of the building in which they lived, in relation to the planning of the building (high-rise or low-rise blocks of flats).

(*b*) The main investigation which aimed at finding out where the children played, how far they wandered from home and how their area of activity and selection of play areas was affected by the planning of the housing environment. This test was carried out partly as a random investigation in various out-of-doors environments, and partly as an interview investigation among the mothers of young children in the areas in question.

(*c*) Field investigation of the attendance habits of the children at the communal play grounds in one of the housing areas.

Only the main investigation (*b*) will be dealt with here. In a high-rise and low-rise housing area in the suburbs of Stockholm, 13 similar observation points were selected. These were distributed among playgrounds, park areas, areas of high traffic density, streets and shopping centres. During a period of three weeks in May and June, 1960, these points were visited once every hour between 8 a.m. and 6 p.m. by one of the Institute's workers. Notes were made of how many children there were from each area who were at the point when the research worker arrived, as well as the child's name, age and address. The date, weather and time of day were also noted. Approximately 550 children were observed. The results from both areas were put together. 80 per cent of the children were out alone or with children of the same age. Apart from a few 3 or 4-year-olds, the children who were accompanied by adults were mainly under 2½ years old. The older the children were, the more often they were observed at all types of observation points regardless of whether these were, from the traffic point of view, suitable or not for children. Children as young as 3 and 4 years were seen in more than one quarter of the cases in places which were dangerous from the traffic point of view, such as roadways, pavements and parking areas. They mostly played alone while their mothers tried to keep them under observation from windows or balconies. 5 and 6-year-olds had less supervision while out-of-doors, and nearly half of them had chosen unsuitable playing areas. 82·5 per cent of the children were within 100 yards of the door of the building where they lived. Most of the children were observed between 10 a.m. and noon and between 3 and 6 p.m. Interviews with mothers confirmed that children as young as 2½–3 years of age were let out alone, and that mothers living in high-rise flats had great difficulty in supervising their children. With the exception of some whose children were too young, all mothers said that they had spoken to their children about traffic. The majority of them believed that their children had understood and could profit by the warnings.

Study of the spontaneous behaviour of young children in traffic.

In the Autumn of 1960 the experiment was continued. For a period of six weeks, observations were made in traffic environments in different parts of Stockholm between the hours of 9 a.m. and noon and 1 to 3 p.m. to see how young children behaved when they were out alone. The observers noted every child under school age who was seen unaccompanied by an adult. The whole situation was noted and a sketch made of the section of the street in question with moving and parked vehicles. The position of the observer and the child's route were plotted and finally the observer's own reaction was recorded. In this way a selection of over 200 such traffic situations were recorded. They showed that children as young as 4 years of age were let out alone in the middle of Stockholm and a shockingly high level of immature behaviour was recorded. This provided a background to a more systematic study, which was undertaken in 1961. Two nursery schools were selected, having a similar traffic situation but located in different parts of Stockholm. 85 children in the age group 4–7 were studied, half boys and half girls in each year group. (Compulsory schooling begins at 7 in Sweden.) Every day for a month the behaviour of the children was observed at street corners near the nursery school both on arrival and departure from school. Records were kept as in the previous investigation. Children were observed crossing the street on 391 occasions, roughly half in each observation area. No significant differences in the traffic behaviour of 4, 5, 6 and 7-year-olds were observed. 52 of the 85 children were observed on several occasions. Their behaviour was divided into three groups, bad, average and good. 23 of the children were included in only one of the groups, 20 within two, and 9 in all three. Thus the same child can be a good pedestrian one day, and a bad one the next. The behaviour of girls was much better than that of boys. No difference was noted between behaviour on arrival at school and on the way home, nor between morning and afternoon groups.

In 1961 we continued with an investigation of children's knowledge of *right and left* and their *understanding of traffic*. Models of streets, cars, etc., were used, together with a printed form containing questions and information. This study was carried out on children in the age groups 6, 7, 8 and 9. The aims were (*a*) to ascertain the applicability of the material and the printed form when testing traffic knowledge of children in the selected indoor situations; (*b*) to see if there was a definite sequence of development from younger to older children; and (*c*) to try to reach a more definite understanding of the difficulties which young children experience in such traffic situations. 80 children took part, 10 boys and 10 girls in each of the year groups. The investigation confirmed the impression obtained from previous studies that young children have great difficulty in playing their role of pedestrians. The children's behaviour with the model material agreed to a great extent with their actual behaviour in real traffic situations. Knowledge about right and left was still far from satisfactory even in 8 and 9-year-olds, as far as practical applications were concerned.

Half of the children in the 6 and 7-year age group were not in command of the model situation at road junctions. They forget, above all, to look behind for turning vehicles, and only half of the 8 and 9-year-olds remembered this. Not even the simple test of going straight over a zebra crossing without any vehicles being involved was passed by more than half of the 6-year-olds or three-quarters of the 9-year-olds. This investigation showed no difference between boys and girls. On the other hand there were obvious improvements with age. Examples of performance on 3 of the 49 tasks or questions set are given in Table 1.

TABLE 1

PERFORMANCE OF CHILDREN AGED 6–9 YEARS ON MODEL TRAFFIC SITUATIONS.

Task	No. of children giving right answers				Total % right answers
Age	6	7	8	9	
Zebra crossing on straight road (not corner): Show me exactly how you must cross here..	8	10	13	14	56
Zebra crossing at street corner: You stand here and you must cross this street. How must you look then?	4	8	11	11	43
Zebra crossings at street corner: Here is one street and here is another one. You stand here and must cross to come here. Show me exactly how you must do then. (Double crossing)	0	1	1	2	5

(N=20 in each age group)

The ability of young children to perceive movements out of the corners of their eyes compared with the same ability in adults.

In 1960-61 work was also in progress on a general survey dealing with the ability of 6-year-olds to perceive movements out of the corner of their eyes, compared with the same ability in adults. This was carried out in co-operation with ophthalmologists, using a round piece of cardboard, 9 mm. in diameter which was placed in the field of vision. 20 6-year-olds from three nursery schools in Stockholm and 20 adults between 20 and 40 years of age, all without known visual defects, took part in the experiment. Half were male and half female. The results showed significant differences between children and adults in that, without exception, the cardboard had to be nearer the eye's fixation point before the children could perceive it. There was no difference between boys and girls. It thus seems that 6-year-olds are not able to see moving vehicles out of the corner of their eyes as quickly as adults can. Also the selection of children for the experiment showed that young children often suffer from defects of vision without either themselves or any responsible adult knowing anything about it.

The ability of 6-year-olds to localise sounds as compared with the same ability in adults.

A similar investigation dealing with the ability of 6-year-olds to localise sounds as compared with the same ability in adults was carried out in 1963 and 1964. 40 children and 40 adults between the ages of 20 and 40 participated. The Institute of Child Psychology carried out this investigation in co-operation with the Department of Technical Audiology at the Royal Caroline Institute; field work was carried out at the Royal College of Technology. During the child's first visit an audiogram was taken and the children were given the chance to become acquainted with the ' silent room ' in which the experiments were to take place. The actual experiment was carried out on the second visit. Adult subjects paid only one visit but were allowed to take a rest between the audiogram and the experiment. Only children and adults with normal hearing were permitted to take part in the tests. The person to be tested sat in a chair exactly in the middle of a ring of loudspeakers, which were so arranged that no echo could occur. The loudspeakers were placed at the same height as the subject's ears and 1·5 m from him. The chair had a neck-rest which was adjusted so that it was comfortable for the subject who, however, could not turn his head. The taped noise of a car engine was played through each loudspeaker. The car appeared to approach, pass and drive off. This was heard for three seconds, then there was a pause of five seconds and the sound was repeated according to a predetermined plan through another loudspeaker which had been selected at random. The task of the subject was to point to the loudspeaker from which the sound came. The tape, which was played on a tape recorder in an adjacent room, was heard eight times in each loudspeaker. The project leader was present in the test room, but outside the ring of loudspeakers. The result of the experiment showed that there were great differences between the ability of adults and children to localise sounds, but little difference between male and female. The adults' evaluations were accurate while the children had fewer correct directional indications and a greater spread of incorrect alternatives. For both groups the position of the noise source was important. If we superimpose the face of a clock on the ring of loudspeakers, with the figure 12 directly in front of the subject, the easiest directions for children to locate were 12, 11, 1 and 6, while adults could also recognise 3, 4, 8 and 9. The children confused the right and left sides more often than the adults. When the audiograms were being taken several children were discovered to have defective hearing, a fact which neither they nor any responsible adult had discovered.

Investigation of children's understanding of road signs.

Our traffic environment is created by adults for adults. This is also true for the design of road signs, but in order to take care of themselves in traffic it is important that young children should know about some road signs, especially the ones which pedestrians and cyclists must recognize and understand. The first observational investigations seemed to show that there were serious gaps in the children's knowledge in these respects.

Several investigations have been made with more than 700 children from both urban and rural areas, from 4 to 10 years of age. The signs were shown to each child in turn, and the answers were recorded and analysed later. Knowledge of road signs increased clearly with age. 4-year-olds knew practically nothing about them and even 10-year-olds had considerable gaps in their knowledge. Qualitative differences were revealed in that 4-year-olds gave only colour or figure answers; the children interpreted the latter (but often incorrectly) but were seldom able to interpret the former correctly. Some children believed that the 'Pedestrian Crossing' sign (man walking) meant that "Only adults may cross here" and the warning sign 'School or Playground' (children running) meant "Here children must run quickly across the road so as not to get run over." The latter traffic sign entices children out into the roadway and thus militates against its own purpose. Road signs should be designed by technicians and psychologists together and carefully tested before being put into use so that they are understandable and unambiguous for all road users and cannot be interpreted in one way by adults and in another way by children.

Young children's comprehension of traffic terms.

As has already been mentioned, the first investigation showed that the mothers of young children aged 2½ years and upwards said that they had given their children some instruction in road safety and believed that the children understood the instruction and could profit from it. Nursery school teachers have also reported to us that they have tried to teach their children about road safety but that they found it difficult. Therefore, in 1960 we began an investigation of the extent to which 5 to 8-year-olds understood words and phrases which often occur when teaching road safety to young children and, in 1961 and 1962, we carried on with a wider study of the 6 to 10 age group. The children were individually provided with some 80 words selected from tape recordings made of talks given by policemen to nursery school children or from words which often occurred in text-books on road safety for the youngest children. The words were listed at random on a form and were given to all the children in the same order. The answers showed that the greatest difference in knowledge was related to age, but sex differences and urban-rural differences also appeared. Misconceptions about the most common traffic words were surprisingly common in all the investigated age groups. Some words were easy for all age groups, others were so difficult that hardly any child understood them, while a third group showed a clear improvement with age. For example, 'easy' words (understood by more than 90 per cent of the children) included: pavement, ambulance, driver. 'Difficult' words included: to walk against the traffic (66 per cent right), vehicle (38 per cent), refuge (4 per cent). Words which showed a clear improvement with age included: pedestrian (9 per cent at age 6, 57 per cent at age 8, 93 per cent at age 10), get out of the way (42 per cent at age 6, 72 per cent at age 8, 91 per cent at age 10). The lists of words in each category will, of course, be different for different languages. If the family owned a car or if the child had a cycle, then children up to and including the age of 8 were better than their classmates without such advantages. For the 10-year-olds access to a car or cycle did not make any difference. An investigation of the comprehension of synonymous traffic words helped us to select words which would be most easily understood by young children when used in road safety instruction.

Two investigations have also been made of the *effect of road safety teaching on children*. The most important of these (1964) dealt with the following problem. Which is the most effective method of teaching groups of children in the nursery school the basic rules for pedestrians in traffic: teaching indoors, teaching out-of-doors in real traffic situations, or a combination of both with the indoor teaching being taken first?

About 80 children took part in the experiment with 20 in each of the named groups and 20 forming a control group which was not given any training. Before the instruction commenced individual interviews dealing with traffic questions were held with each child. Individual behaviour tests were also held in real traffic situations. Thanks to the co-operation of the police, these tests were held in closed-off streets (though this was unknown to the children). The rules we wished to inculcate were the following:

(1) Stop at the edge of the kerb before stepping out into the road.

(2) Look right and left before stepping out into the road and listen.

(3) Walk straight across the road at the pedestrian crossing.

(4) Cross at places marked with a zebra crossing and road sign and watch out for vehicles turning the corner.

The interviews showed that there was a great deal of uncertainty among the children as to how to behave in such situations. The tests showed many cases of incorrect behaviour. Training was then given in four periods spread over two weeks, after which the interviews and the practical tests were repeated. Before the training there was hardly any difference between the four groups of children and the results of both the interviews and the tests were pretty much the same. After the training had been given, the results were considerably different for all groups except the control group. Children who were given nothing but indoor instruction showed the least improvement over their performance at the initial interviews. Out-of-doors instruction was better and this showed both in the interview answers and in the practical tests. Combined indoors and out-of-doors instruction was, however, best. The final tests showed that the most difficult points to learn were (*a*) to look back when crossing over the road at a street corner, (*b*) to look right and left when crossing a road and (*c*) to go straight across the road.

Young Children in Traffic concludes with a summary, a discussion of the important results and a brief outline proposal for basic road safety training intended for use in the home, nursery schools and the lower division of the comprehensive school. An appendix deals with the requirement for a change in the law dealing with children's liability to damages.

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PERSONALITY IN PRIMARY SCHOOL CHILDREN: 3.—FAMILY BACKGROUND

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SUMMARY. Family size, position in family, parental occupation and parental interest were investigated in some 4,000 boys and girls of primary school leaving age in relation to personality, intelligence and school achievement. Smaller families were associated with brighter, more extraverted and less neurotic children. Parental occupation was associated with both extraversion and stability in children, as well as with intelligence and achievement. Parental interest, correlated with status, was connected with extraversion, and most strongly with intelligence and achievement. Early-born children tended to do better at school, but not to differ from later-born children in personality or ability.

I.—INTRODUCTION.

THE first paper in this series has described the method of data collection, the sample used, and the information analysed (Eysenck and Cookson, 1969). Scores of some 4,000 11-year-old boys and girls on the Junior Eysenck Personality Inventory were analysed in relation to performance on scholastic and ability tests. This paper will deal with certain variables relating to family background, i.e., size of family, position within family, parental occupation and parental interest. There is quite a large literature on these various topics, but the outcome of the many studies undertaken in different countries is neither very clear nor easy to understand theoretically. There is, of course, much agreement on the existence of a small negative correlation between achievement and ability on the one side, and family size on the other (Anastasi, 1956, 1957; Ferreira and Oakes, 1960; Nisbet, 1958; Palermo, 1962; Poppleton, 1968; Scott and Nisbet, 1955; Verma, 1958), but with respect to personality variables the position is more obscure (Altus, 1959; Ganda, 1962; Hawkes *et al.*, 1958; Lees, 1953; Thurstone and Jenkins, 1931). Few of these studies throw much light on the extraversion and neuroticism variables which were tested in our own study. Family position, too, has been much investigated, from the early days of Goring's (1913) and Pearson's (undated) demonstration that elder-born children show a disproportionate frequency of criminals and insane. Since then such writers as Hillinger (1958), Jones (1946), Krumboltz and Krumboltz (1958), Smart (1963) and Smith and McIntyre (1963) have related position in the family to a variety of behaviour patterns including alcoholism, psychiatric illness, and teaching ability. First-born children, however, do not always come out as delinquent or insane; Jones (1946) quotes data to show that first-born are actually over-represented among gifted children, English eminent men, entries in Men of Science and Who's Who in America; these disproportions arise equally in two-child, three-child and four-child families. This fact was first noted by Galton (1874) and confirmed by Ellis (1904) and Terman (1925). Other contributors include Allman and White (1968), Altus (1963), Bossard and Boll (1955), Busemann (1928), Dember (1963), Dittes (1961), Eisenman (1966, 1967, 1968), Glass *et al.* (1963), Green (1967), Gross (1964), Hall and Barger

(1964), Hinshelwood (1968), Jacoby (1968), Jamieson (1969), Rosenberg and Sutton-Smith (1964), Schachter (1959), Siegelman (1966), Singer (1964), Stotland *et al* (1962, 1963), Staples and Walters (1961), Weller (1962), Weiss (1966), Wrightsman (1960) and Zuckerman and Link (1968); reviews are available in Altus (1966), Burton (1968), Sampson (1965) and Warren (1966). Cross-cultural studies have been reported by Diab and Prothro (1968) and Greene and Clarke (1968).

Evidence on parental occupation and parental interest is quite considerable, at least as far as ability and achievement are concerned; Butler *et al.* (1966), Douglas (1964), Gooch *et al.* (1967), Peaker (1967) and Wiseman (1967) furnish an adequate introduction to this part of the literature. There is not much evidence, however, on personality variables in this connection. It seems likely that these are tied in with ability variables because of the correlations disclosed in our first paper between extraversion and ability/achievement, but more than that it is difficult to say. In the absence of strong guidance from past research, and in view of the lack of theoretical considerations which could furnish us with much guidance, the data of this paper must be left to speak for themselves; they cannot be used very easily for any hypothetico-deductive type of treatment.

Analysis of results was undertaken, as in the previous paper, by both analysis of variance and by product-moment correlation. For the former type of analysis records were extracted in such a manner as to construct as a $2 \times 3 \times 3$ table of means (2 sexes, 3 grades of E, 3 grades of N) with equal numbers of children in each cell. The number of children in each cell average between 170 and 180, the inequalities being due to occasional absence of full records for a given child, necessitating the dropping of one child each in the other 17 cells. Correlational analyses were carried out on all the available data.

II.—RESULTS.

(*a*) *Size of family*. The detailed scores are given in Table 1; the only variable which is highly significant statistically is E ($P < \cdot 001$). Sex also has a significant P value ($< \cdot 05$), as has the $S \times E \times N$ interaction ($P < \cdot 05$). The more extraverted children tend to come from the smaller families; this is not perhaps the result which one would have predicted, but it is clearly shown by both girls and boys. The differences in mean size of family between E and I children are not large, but they amount to 0·30 for boys and 0·57 for girls, differences which cannot be overlooked and must be accepted as real. It must, of course, be admitted that these families are not yet complete in many cases,

TABLE 1

SIZE OF FAMILY.

	Boys				Girls			
	N—	A	N+	All	N—	A	N+	All
I	3·46	3·03	3·27	3·25	3·44	3·62	3·55	3·54
A	3·03	3·29	3·38	3·23	3·24	3·17	3·47	3·30
E	2·70	3·15	3·01	2·95	2·93	2·88	3·10	2·97
All	3·06	3·15	3·22	3·15	3·20	3·23	3·38	3·27

I=introverts. A=ambiverts. E=extraverts. N— =stable. A=average.
N+ =emotionally unstable.

and that it is possible that the observed difference might be eliminated, or reversed, if only complete families had been considered. It is not obvious, however, why this factor should generate the results found, and until some hypothesis is offered we cannot regard this as a serious proposition.

The sex difference is very slight; as far as it goes girls come from larger families. However, with such large numbers results often achieve statistical significance without producing psychologically or socially important differences, and this would appear to be such a case. The triple interaction, too, probably belongs to this category of pseudo-significant results; no obvious psychological explanation suggests itself for it. Descriptively, it seems to originate in the fact that the general progression of greater family size with increase in N score, which occurs for both boys and girls, becomes U-shaped at different levels of E for boys and girls.

(*b*) *Position within family.* Here the only significant result ($P < \cdot 01$) is that extraverted children are born earlier into their families than introverted children; the differences are not large, but they occur equally for boys and girls. This finding, which is shown in detail in Table 2, may be nothing but an artefact due to the fact noted above that introverts more frequently come from larger families; this would automatically make their average position assume a higher value. The fact that the differences in position are quite small suggest that this is the most likely explanation.

TABLE 2

POSITION IN FAMILY.

	Boys				Girls			
	N−	A	N+	All	N−	A	N+	All
I	2·21	2·04	2·14	2·13	2·08	2·41	2·23	2·24
A	1·99	2·07	2·09	2·05	2·21	2·09	2·14	2·15
E	1·88	2·09	1·92	1·97	1·98	2·03	1·99	2·00
All	2·03	2·07	2·05	2·05	2·09	2·18	2·12	2·13

In some ways these findings contradict well-established beliefs that first-born children are more introverted (Price, 1969; McArthur, 1956). However, many of the items given by Price (in his Table 3) relate to schoolwork (more natural ability at schoolwork; worked harder at his schoolwork; given more responsibility at school); or intelligence (learned to talk at a younger age; earlier at learning to read). But there is no doubt that the majority of items favour the hypothesis of greater introversion in first-born children (less fond of cuddling and similar contacts: easier to train to avoid traffic; tidier; higher standards; less impulsive; more serious, more regular and methodical; more law-abiding; less happy, optimistic disposition; spends less time on social activites). It seems possible that our findings would have been different had we tested 15-year-olds rather than 11-year-olds; as suggested in the first paper of this series, introverts are late developers, and possibly change not only in intellectual ability but also in personality. Clearly only detailed follow-up studies are capable of sorting out those various strands of evidence.

(*c*) *Parental occupation.* The details under this heading are given in Table 3; occupations are rated from high (1) to low (5). Both N and E are highly significant ($P < \cdot 001$); $S \times E$ and $N \times E$ interactions are also significant

($P < \cdot 05$). High family occupation is encountered more frequently in the parents of extraverted children and of low-N children ; in other words, stable extraverts come from the more affluent homes. For both sexes combined, the difference between stable extraverts (2·87) and neurotic introverts (3·16) is almost one-third of the s.d. of the distribution of parental occupation scores ; the true difference is no doubt greater still because the method of ascertaining parental occupation was undoubtedly less than perfectly accurate.

TABLE 3

PARENTAL OCCUPATION.

	Boys				Girls			
	N—	A	N+	All	N—	A	N+	All
I	3·12	3·09	3·13	3·11	3·14	3·27	3·20	3·21
A	2·81	3·36	3·15	3·11	2·90	3·07	3·13	3·03
E	2·89	3·12	2·99	3·00	2·84	2·86	3·01	2·90
All	2·94	3·19	3·09	3·07	2·96	3·07	3·11	3·05

The sex/extraversion interaction is apparently due to the greater relationship between parental occupation and E in the female group ; the difference between extraverts and introverts is ·11 for the boys but ·31 for the girls. The N/E interaction is caused by the failure of some of the N columns to show a regular decrease in occupation scores with increasing extraversion. Neither effect is probably of much importance, and unless replicated in future research cannot be accepted as factual.

(*d*) *Parental interest.* This variable shows a very slight sex effect ($P < \cdot 05$), with females receiving greater parental interest. Extraversion shows a very significant relationship ($P < \cdot 001$), the details of which are given in Table 4. Parental interest is shown more for the extraverted than for the introverted children, and this relationship is more clearly expressed for the girls than for the boys, as evidenced by a very significant sex/extraversion interaction ($P < \cdot 001$).

TABLE 4

PARENTAL INTEREST.

	Boys				Girls			
	N—	A	N+	All	N—	A	N+	All
I	2·41	2·36	2·41	2·39	2·36	2·63	2·48	2·49
A	2·25	2·45	2·48	2·39	2·18	2·34	2·28	2·26
E	2·29	2·25	2·21	2·25	2·06	2·03	2·10	2·06
All	2·32	2·35	2·37	2·34	2·20	2·33	2·29	2·27

(*e*) *Correlational analysis.* Table 5 records, for boys and girls separately, the correlations between the four familial variables and selected personality, teachers' ratings and intelligence variables. Altogether, there are 1,869 boys and 2,162 girls in this sample. Size of family is so highly correlated with position in family (·69 for boys, ·70 for girls) that no special discussion of the latter variable seems called for; in a small family a child's position must inevitably be first or second. Size of family shows the usual inverse correlation with occupation (—·22 and —·23), and also with parental interest (—·28 and —·27); low-occupation parents tend to have larger families and to show less interest in their children's work (at least in the judgment of the teachers). High status and parental interest are positively correlated (·44 for both boys and girls). These results make good sense, and are in agreement with previous findings.

TABLE 5

CORRELATIONS WITH FAMILIAL VARIABLES.

	Boys				Girls			
	Fam. Size	Fam. Pos.	Occu.	Par. Int.	Fam. Size	Fam. Pos.	Occu.	Par. Int.
1. Age	·07	·04	—·02	—·01	·07	·03	—·03	·01
2. Extraversion	—·11	—·08	·12	·12	—·11	—·09	·12	·11
3. Neuroticism	·09	·04	—·09	—·10	·08	·04	—·09	—·10
4. Lie score	·01	—·00	—·08	—·03	·01	—·01	—·08	—·03
5. Stability	—·05	—·03	·08	·24	—·04	—·04	·09	·25
6. Perseverance	—·08	—·07	·22	·40	—·09	—·08	·24	·42
7. Sociability	·00	·04	·06	·19	·00	·04	·07	·19
8. Impulsiveness	·05	·07	—·08	—·20	·05	·07	—·10	—·20
9. VR 70	—·22	—·18	·42	·43	—·22	—·19	·41	·44
10. Grammar School	—·13	—·09	·35	·37	—·13	—·10	·35	· 38
11. Family Size	/	·69	—·22	—·28	/	·70	—·23	—·27
12. Position in Family	·69	/	—·17	—·21	·70	/	—·18	—·22
13. Occupation · high status	—·22	—·17	/	·44	—·23	—·18	/	·44
14. Parental interest: high	—·28	—·21	·44	/	—·27	—·22	·44	/

Children from large families tend to be duller; correlations with VR 70 are —·22 for both boys and girls, a figure which agrees well with previous researches. Figures for success in various school subjects are almost identical: reading (—·20 and —·21), maths. (—·22 and —·21), English (—·23 and —·22); so are the figures of VR 71 (—·22 and —·23). They are rather lower for grammar school entrance: —·13 for both boys and girls.

Children from large families are more introverted, and more neurotic; on teachers' ratings they appear less stable, less persevering, and more impulsive. All these correlations are very small indeed, but as far as they go they support the results from previous analyses of variance.

High occupational status of parents goes with intelligence and grammar school entrance; it also goes with school success. Correlations are all positive with subject examinations: reading (·34 and ·34), maths. (·39 and ·39), and English (·41 and ·38). On the personality side, children from high status parents are more extraverted, less neurotic, have lower scores on the Lie scale; they are rated as more stable and persevering, more sociable and less impulsive. Correlations are similar, but higher for the personality variables as far as teachers' ratings go, when we consider parental interest; all the relations are in the same direction as for occupational status. We thus find emerging a compound picture of the intelligent, high-occupational-status child, pushed by interested parents, extraverted and emotionally stable, sociable and persevering, who succeeds in his school subjects and goes on to grammar school.

This picture is probably much influenced by occupational status,which correlates with all the variables in which we are interested (size of family and position in family; E, N and VR test scores). However, analysis by partial correlation indicates that the observed correlations are on the whole only slightly diminished, and remain significant, even when occupational status is partialled out. Size of family now correlates —·09 with E, ·07 with N, and —·14 with VR; position in family now correlates —·06 with E and —·12 with VR. But size of family affects the position in family effect to a much more decisive extent; when it is partialled out, family position only correlates —·01 with E and —·04 with VR. Thus clearly for these variables family size is the crucial causal factor, although occupational status works in the same direction; position in the family is irrelevant, and only acts through its correlation with size of family. It might be argued that if position in family were to be partialled out from the size of family correlations, then these too would be markedly reduced, and this objection is well taken; partialling out procedures never give clear-cut answers to questions of causal priority. It is for this reason that yet another type of analysis has been attempted, and will be described in the next section. The conclusion outlined above is in part written in anticipation of this new type of analysis, which enables us to study the influence of these two confounded sets of causes (size of family and position in family) in complete independence of each other.

III.—FAMILY SIZE *versus* POSITION IN FAMILY.

As pointed out several times, family size and position in family are not independent, and hence it is difficult to assign proper causal meaning to observed differences. A first-born child may differ from a fifth-born because of its position in the family, or because of the likelihood that it comes from a much smaller family. A special analysis was carried out by calculating mean scores for all variables in groups arranged by family size and position, i.e., first-borns were separated according to the size of family from which they came, and so were second-born, third-born, fourth-born and fifth-born children; sixth-born, of course, must come from a six-child family (we have grouped all families with more than six children together with the six-child families in view of the smallness of numbers involved). The grouping involved is shown for the variable Extraversion in Table 6; given in the table are the mean scores of the 21 groups involved. Table 7 shows the number of children in each group; boys and girls have not been kept separate as otherwise numbers would have been very small in some of the cells.

TABLE 6

FAMILY POSITION: MEAN E SCORES.

Family Size	1st	2nd	3rd	4th	5th	6th+	P<
1	17·46						
2	17·28	17·22					NS
3	16·98	16·98	17·00				NS
4	17·17	16·91	17·15	16·61			NS
5	16·17	16·28	15·85	16·27	16·63		NS
6+	15·86	16·15	16·46	16·16	16·03	15·88	NS
P<	·01	·05	·05	NS	NS		

TABLE 7

FAMILY POSITION : NUMBER OF CHILDREN IN EACH GROUP.

Family Size	1st	2nd	3rd	4th	5th	6th+
1	379					
2	639	537				
3	334	343	260			
4	145	201	177	121		
5	65	71	65	55	60	
6+	35	72	90	91	78	144

Similar tables were constructed for all other variables. It is now possible to carry out analyses of variance (*a*) for the whole table, and, if this gives significant results, (*b*) for the rows and (*c*) the columns separately, thus enabling us to separate out size from position effects. Six values are given in each table for rows and columns. A more detailed discussion of the figures in Table 6 will illustrate the method ; the other variables will be discussed in less detail. In Table 6 the highly significant overall analysis of variance ($P < \cdot 01$) leaves little doubt that more detailed analysis is permissible There are five analyses possible for family position (first *versus* second in two-child family ; first *versus* second *versus* third in three-child family ; and so on to 6+ child family. None of these comparisons is significant, thus confirming the result of simply inspecting the values given in Table 6. Analysis for family size also allows us to make five separate analyses (different family sizes for first-borns, second-borns, etc., up to fifth borns). The results show that for first-borns $P < \cdot 01$; for second and third-borns $P < \cdot 05$; for the other two groups P is non-significant (although the trend towards lower values of E for larger families is maintained). It is clear that in this population there is a distinct tendency for larger families to have less extraverted children and that family position is not related to E. The published figures are likely to underestimate the true relation between E and family size as many of the families studied are undoubtedly incomplete, and will become larger in due course. It seems unlikely that changes in family size will alter the position of E as related to family position ; this is less obviously affected by changes of this kind. Individual t tests were carried out ; these, as might have been expected, assume significance in relation to the extreme groups (five and six+ children in family) rather than to intermediate groups.

Table 8 gives figures for N ; inspection reveals that there is a tendency for high N scores to be found more in the larger families, although the trend is not

TABLE 8

FAMILY POSITION : MEAN N SCORES.

Family Size	1st	2nd	3rd	4th	5th	6th+	P<
1	12·92						
2	13·05	13·50					NS
3	13·56	13·70	13·49				NS
4	13·86	13·99	13·51	12·99			NS
5	14·09	14·75	13·58	13·53	14·42		NS
6+	15·57	14·51	13·44	14·55	13·79	13·74	NS
P<	·01	NS	NS	NS	NS		

as clear-cut as it was for E. Again the overall F is significant at P < ·01, and again family position gives no significant F values. Family size is significantly related to N for first-borns (P < ·01), but not for any of the other sets of groups although these show a similar tendency for N to increase with size of family. Again it seems likely that the results are attenuated by the fact that families are not yet complete.

We next turn to the results for the Lie scale; there is here no overall significance, and although individual F values were calculated, all except one were also insignificant. This one significant value (P < ·05) is between the first and second child in a two-child family, and can hardly be taken seriously. We must conclude that the data do not justify us in assuming that L scores are determined in any way by family size or position.

Of the four ratings made by teachers (sociability, emotional stability, perseverance and impulsiveness), none except sociability (P < ·05) reaches overall significance. Table 9 gives the actual mean values for sociability ratings: it will be seen that there is a mild tendency for the children from larger families to be rated as being less sociable. However, although this fits in with the data for E scores, none of the group analyses of variance was significant, so that little confidence can be placed on these findings.

TABLE 9

FAMILY POSITION: MEAN SOCIABILITY RATINGS.

Family Size	1st	2nd	3rd	4th	5th	6th+	P<
1	2·99						NS
2	3·00	2·92					NS
3	2·95	2·84	2·87				NS
4	3·01	2·92	2·79	2·95			NS
5	3·23	2·93	2·89	2·98	2·88		NS
6+	3·09	3·10	2·92	3·04	2·86	3·02	
P<	NS	NS	NS	NS	NS		

Table 10 gives the reading scores of the children; overall F gives a highly significant value (P < ·001). Analysis confirms the impression that all the significance derives from differences in family size; none of the position analyses gives significant F values. First-borns give the most significant family

TABLE 10

FAMILY POSITION: MEAN READING SCORES.

Family Size	1st	2nd	3rd	4th	5th	6th+	P<
1	65·67						
2	63·50	62·28					NS
3	63·07	61·33	60·41				NS
4	61·57	60·66	61·32	56·74			NS
5	61·83	62·21	57·97	58·62	57·15		NS
6+	55·69	56·01	55·90	55·19	51·78	53·42	NS
P<	·01	·05	NS	NS	NS		

size differences (P < ·01), followed by second-borns (P < ·05); the other comparisons are not significant. Reading ability is thus strongly affected by family size.

Tables 11, 12 and 13 give results for VR 70, English and mathematics; all are clearly significant, and inspection of the tables shows that again it is size of family rather than position in family which is the important variable. Children from smaller families have higher scores in all three tests, and to almost identical degree in all three tests. The regressions are pretty linear, and the differences between smallest and largest amount to almost ½ s.d.—differences which in turn would presumably be even larger had only complete families been used.

TABLE 11

FAMILY POSITION: MEAN VERBAL REASONING SCORES (VR 70).

Family Size	1st	2nd	3rd	4th	5th	6th+	P<
1	96·41						
2	96·09	96·13					NS
3	95·81	94·94	93·97				NS
4	94·68	94·33	93·81	92·00			NS
5	94·57	94·35	92·28	92·51	89·85		NS
6+	90·37	89·97	91·57	91·05	88·81	88·64	NS
P<	·01	·001	NS	NS	NS		

TABLE 12

FAMILY POSITION: MEAN ENGLISH SCORES.

Family Size	1st	2nd	3rd	4th	5th	6th+	P<
1	97·52						
2	96·68	95·86					NS
3	96·09	94·94	93·83				·05
4	95·69	94·32	93·75	90·94			·01
5	94·72	94·89	92·26	91·64	90·75		NS
6+	89·83	90·61	91·47	91·14	87·67	88·19	·05
P<	·01	·01	NS	NS	NS		

TABLE 13

FAMILY POSITION: MEAN MATHEMATICS SCORES.

Family Size	1st	2nd	3rd	4th	5th	6+	P<
1	95·58						
2	.95·25	94·61					NS
3	94·56	94·01	92·80				NS
4	92·76	93·73	92·46	89·93			·05
5	93·45	92·79	91·57	91·00	89·57		NS
6+	89·89	88·85	90·37	89·23	88·68	87·62	NS
P<	·01	·01	NS	NS	NS		

For VR 70 there is no significant 'position in family' effect, but for VR 71 such an effect appears for the four-child and the six-child family; in both cases of course the earlier children are the brighter ones. This is in accord with the literature, but it is not clear why this effect should not have emerged significantly with VR 70.

Mathematics and English show a significant trend for early-born children to do better than later-born, when size of family is held constant. For maths. the tendency is significant only for the four-child family ($P < \cdot 05$), but for English significance emerges for the three-child ($P < \cdot 05$), four-child ($P < \cdot 01$) and six-child ($P < \cdot 05$) family. Taken together with the significant results from the VR 71 test this suggests that for ability/achievement measures early-born children have the advantage; this conclusion is more apparent for achievement than for ability, and this fact may support the interpretation often made of similar findings by others that early-born children are given better educational opportunities. On the other hand, this facile phrase does not carry much obvious meaning when applied to children as young as these; it makes more sense in relation to college students. Neither does it explain the failure of the reading scores to show family position differences. Our data do not enable us to give any convincing answer to the causal problem raised by our results. However, it may be of some interest to compare visually the trends of the personality variables (where family size alone is relevant), and the trends of the achievement variables (where family position as well as family size is relevant), and accordingly the data from Tables 6 and 12 have been plotted, and are reproduced in Figures 1 and 2. It will be seen that as far as scores on extra-

FIGURE 1

EXTRAVERSION SCORES AS RELATED TO POSITION IN FAMILY AND NUMBER IN FAMILY.

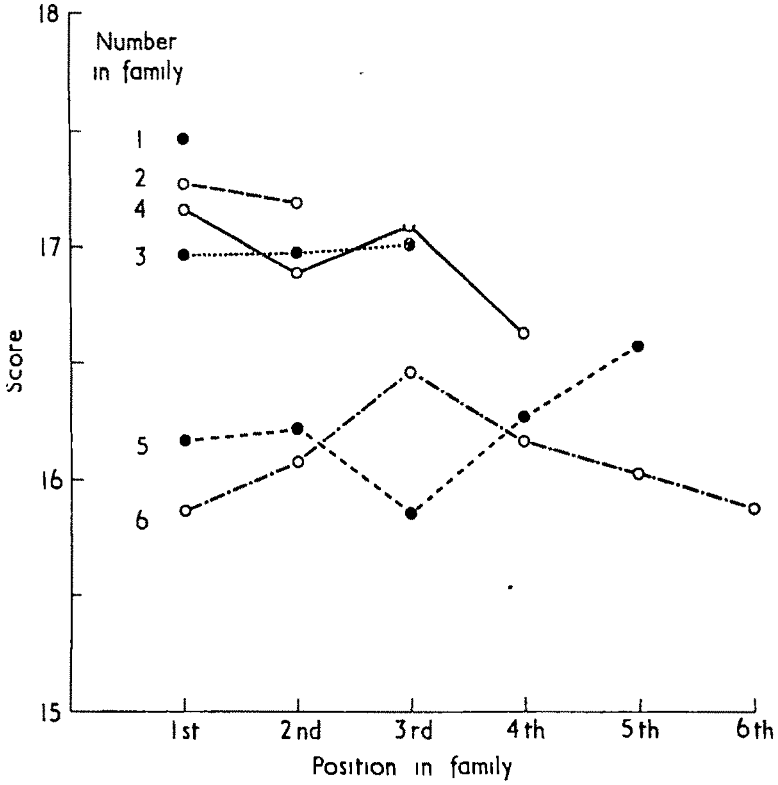
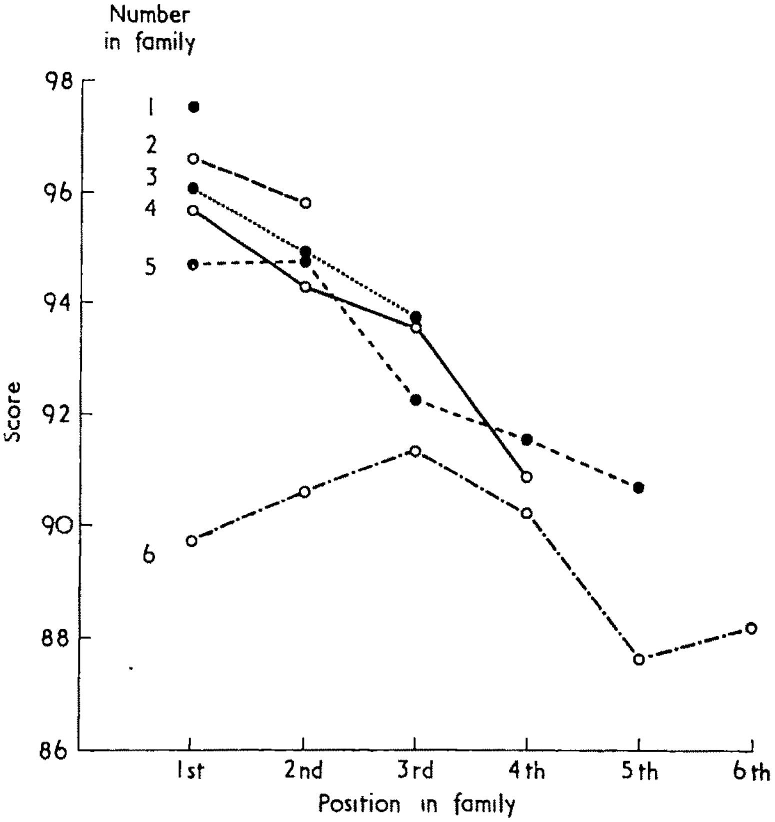


FIGURE 2

SCORES IN ENGLISH EXAMINATION AS RELATED TO POSITION IN FAMILY AND NUMBER IN FAMILY.



version are concerned there is a steady and regular decrement with increase in size of family, but all the 'position in family' lines run parallel to the abscissa. For English, the same steady and regular decrement is observed with increase in the size of family, but there is also a regular decline in the 'position in family' lines from left to right. This clear-cut difference constitutes a major finding of this study.

IV.—DISCUSSION.

The problems involved in investigating the relationships between size of family and position within family on the one hand, and personality, ability and achievement on the other, are complicated by the fact that (*a*) size of family and position within family are highly correlated, that (*b*) personality and ability/achievement are not independent, that (*c*) status is correlated with both size of family and the personality-ability-achievement complex, and that (*d*) the families investigated are in any case not complete, so that the relations found between family variables and psychological variables are almost certainly much attenuated as compared with those which would be found had only complete families been used. This last point is important because it suggests that the observed relationships, which are statistically not very impressive even though significant, would probably come out much more strongly if complete families had been used; unfortunately, this is of course impossible by definition—a study of the personality and performance of children cannot be undertaken except whilst their parents are young enough to have further children after the completion of the inquiry. Only a large-scale long continued follow-up would enable us to obtain terminal data on family size, and such a study was not feasible in view of very limited resources.

The other complexities mentioned make any simple and straightforward statistical analysis impossible, and for this reason three different types of analysis have been performed; these make different statistical assumptions, and combine data in different ways, so that the mutual support which they give each other may suggest that the final conclusions arrived at are perhaps in line with reality. These conclusions are on the whole not opposed to previously reported results, particularly in the ability/achievement field; previous work with personality variables has not on the whole been sufficiently clear-cut to enable meaningful comparisons to be made.

What then are our main results? The analysis of variance discloses six definite findings:

(*a*) extraverted children come from small families;
(*b*) neurotic children come from large families;
(*c*) extraverted children come from high-status families;
(*d*) neurotic children come from low-status families;
(*e*) more parental interest is shown to extraverted children, particularly to girls;
(*f*) extraverted children tend to be earlier-born, but this may be due to their being born into small families, and thus be a statistical artefact as shown by direct comparison later.

The correlational analysis confirms findings (*a*) and (*b*), even when status is partialled out, thus demonstrating that the effect is not a mere statistical artefact. It is also found that high status families have fewer children, show more interest in their children, and have children who are brighter and better at school. Children from large families are duller, and do less well in school, than children from small families. Such effects as are observed for position in family on ability and personality are most likely due to size of family, as shown by partial correlation techniques.

Our final analysis separating out by analysis of variance size and position effects confirms that for personality size of family is the only variable which exerts an effect; position within family is irrelevant. The same is true of intelligence; with only the slightest suggestion of a position effect, the general impression is one of overwhelming importance of size of family. The same is true of reading; here, too, position within family is unimportant. The position is quite different for the two achievement papers, English and maths.; here position within the family clearly is independently and significantly related to achievement, in the sense that early-born children do better than later-born children; size of family, too, is of course important, in the sense that children from smaller families do better, as we had already shown by previous analyses. Why achievement should show this effect is not clear, although the fact itself is not unexpected from the results of previous work; the usual explanation of greater parental stress on education is not as clearly applicable to youngsters of this kind as it would be to students where parents have to make sacrifices to enable the child to continue his or her education. Nor is it clear why reading, which after all, is a scholastic accomplishment highly correlated with English, shows no position effect; parental pressure would seem likely to be brought to bear on this skill more than on any other, perhaps more esoteric one. While our findings are clear enough, and in good accord with traditional findings and folklore, their interpretation is by no means clear.

We can conclude, therefore, that size of family is significantly correlated with the personality, ability and achievement of 11-year-old school children, with smaller families tending to give rise to intelligent and stable extraverts even when the influence of status has been removed by statistical manipulation. Position in family is not relevant to either personality or ability, but early-born children do better in school than later-born children, a fact which we find it difficult to explain. Further studies with different samples, particularly with older children, would seem to be needed before any larger generalisations become possible.

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THE RELATIONSHIPS BETWEEN PERSONALITY, STUDY METHODS AND ACADEMIC PERFORMANCE

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Summary. 139 university students and 118 students at a college of education were given the Eysenck Personality Inventory and a questionnaire relating to academic motivation and study methods. A correlational analysis of these scores in relation to academic performance at the end of the first year showed the superiority of introverts and students with good study methods. Introverts also tended to have better study methods, but this only partially explained their high academic performance. There was no relationship between neuroticism and attainment. A supplementary approach used an item-analysis to identify the characteristics of successful students. From this analysis, items which identified good students were also positively related to stability and introversion.

I.—Introduction.

A number of recent studies have drawn attention to personality correlates of school attainment. Both Eysenck (Eysenck and Cookson, 1969) and Cattell (Cattell *et al.*, 1966) have reported low, but statistically significant, correlations between pupils' achievement and scores on various personality scales. Eysenck, in particular, has concentrated his interest on the dimensions of extraversion and neuroticism (emotional instability). A majority of studies on children aged between 11 and 13 have shown small positive correlations between extraversion and attainment and indications of a negative relationship between neuroticism and attainment. Another personality trait which has been measured among this age-group by the use of inventories is ' academic achievement motivation ' (Buxton, 1966 ; Entwistle, 1968). Again, significant relationships with school attainment were reported.

Comparing studies at university level (Furneaux, 1962 ; Kelvin *et al*, 1965) with those using school children, distinct differences emerge. Both Furneaux and Kelvin reported results which indicated the academic superiority of the unstable introvert—a totally opposite finding from the good school performance of the stable extravert. A partial explanation of this contradiction in relationships may be found in another study on school children (Entwistle and Welsh, 1969). While the correlation between extraversion and achievement was near zero for the complete ability range, a negative value (—·102) was found among bright boys. On the neuroticism dimension the equivalent correlations were —·150 for the complete ability range and —·040 for this same group of bright boys. Similar, but less distinct, differences between bright girls and the total sample were also found. As university students are a highly selected group and also comprise more men than women, the good performance of introverts in higher education should not be surprising. It is less easy to reconcile the findings on the neuroticism dimension.

The two most widely quoted British studies have clearly identified unstable introverts as successful examinees in universities, but more recent evidence from both America (Lavin, 1967) and Britain (Entwistle and Wilson, 1970) challenges the generality of this finding. In summarising the American studies, Lavin reports a majority of results suggesting that stable introverts make the best students. Entwistle and Wilson found no relationship between neuroticism and degree class in Aberdeen, but a highly significant link between introversion and good honours degree status. In all these studies at university level, introverts appear, as a group, to be successful students, but emotional instability has a less certain relationship with academic performance.

Academic achievement motivation has also been measured among college students in America. Finger and Schlesser (1965) showed that their Personal Values Inventory accounted for as much variance in college grades as did an academic aptitude test. A factor analysis of the items in this inventory produced a factor of 'academic motivation' which had high loadings on 'achievement need' and 'persistence.' Other workers (Austrin, 1965; Taylor and Farquhar, 1966) have identified items from existing personality inventories which discriminate between successful and unsuccessful students.

These American studies met with sufficient success to encourage the construction of a similar inventory for use in Britain (Entwistle and Wilson, 1970). Items with appropriate face validity were drawn from theoretical descriptions of the achievement motivation construct (Atkinson and Feather, 1966) and from experience of students. Motivation and study method items were interspersed with more general personality items to disguise the purpose behind the inventory. Indications of concurrent validity were inferred from the relationships between these dimensions and degree result. An interesting subsidiary finding was that students with high motivation scores tended to be unstable introverts whereas those with high study methods scores were predominantly stable introverts. The results from the Aberdeen study were used to refine these two scales, which have since been applied to another sample of students.

II.—THE PRESENT STUDY.

The sample consisted of 257 first-year students. 139 (96 men and 43 women) were at university taking a wide range of courses and 118 (40 men and 78 women) were in a college of education. The university sample was obtained by choosing a number of contrasting first-year classes and asking students (by letter) to take part in the project. The college sample was obtained by talking to all the first-year students attending a particular lecture. Volunteers were asked to complete, during the Spring term, a 'Student Attitudes Questionnaire,' which included a section on study methods and either Form A or Form B (randomly allocated) of the Eysenck Personality Inventory. After a reminder letter towards the end of the term, 62·7 per cent of the students in the defined groups were persuaded to complete both questionnaire and inventory. The non-responders were identified and a check was made on their marks at the end of the first year. The frequency distributions of responders and non-responders in both college and university were almost identical.

The questionnaire and inventory yielded four scores—motivation, study methods, extraversion and neuroticism. Eysenck and Eysenck (1964) report the test-retest reliabilities of the two EPI scales, after an interval of one year as around ·85. The content of the questionnaire scales would imply lower values, but no evidence has yet been collected to confirm this supposition.

The section of the questionnaire relating to study methods included a question on the number of hours spent studying during the previous week. It was anticipated that many students would have difficulty in reporting this information and thus a grid, shown as Figure 1, was provided to assist them.

FIGURE 1

INSTRUCTIONS AND GRID USED TO COLLECT INFORMATION ON NUMBER OF HOURS WORKED BY STUDENTS IN THE PREVIOUS WEEK.

How many hours *last week* did you spend on your own work ? The grid below has been designed to help you remember. Please include all types of studying (reading, writing-up practicals, essays, etc.). We are interested in your *typical study pattern*. If last week was unusual, or if you don't remember exactly when you worked, indicate your approximate study pattern *without exaggerating*. Ring the number of hours you worked (even if it was 0) in each part of each day.

Day	Number of Hours Worked			
	Morning	Afternoon	Evening	
Sunday	0 ½ 1 2 3	0 ½ 1 2 3	0 ½ 1 2 3 4	
Monday	0 ½ 1 2 3	0 ½ 1 2 3	0 ½ 1 2 3 4	
Tuesday	0 ½ 1 2 3	0 ½ 1 2 3	0 ½ 1 2 3 4	
Wednesday	0 ½ 1 2 3	0 ½ 1 2 3	0 ½ 1 2 3 4	
Thursday	0 ½ 1 2 3	0 ½ 1 2 3	0 ½ 1 2 3 4	
Friday	0 ½ 1 2 3	0 ½ 1 2 3	0 ½ 1 2 3 4	Grand Total
Saturday	0 ½ 1 2 3	0 ½ 1 2 3	0 ½ 1 2 3 4	
Total hours worked :	Morning	Afternoon	Evening	

Previous academic achievement was assessed as the sum of A-level grades and a criterion of academic performance at the end of the first year of higher education was also obtained. The criterion used for the university students was the sum of marks from three subjects. The addition of marks derived from different subject areas can lead to misleading rank-orders (see, for example, Nisbet and Entwistle, 1970, Chapter 9). For this reason, marks from each subject were scaled to produce an arbitrary, but equal, standard deviation for each department. It was not possible to apply the same procedure to the marks received from the college, but all students had taken one common examination (Education). This was considered to provide the most reliable criterion, though its validity might well be challenged. A further difference between the two criteria was that the university marks contained an element of course work in the assessment. It is worth bearing in mind that the introduction of course work may affect the relationships found with personality variables.

III.—RESULTS.

Mean Scores.

Differences in the criterion used in college and that in university and the possibility of sex differences in relationships, suggested that the results should be presented, where possible, separately by sex for each institution.

The mean scores shown in Table 1 were compared with the norms shown in the manual (Eysenck and Eysenck, 1964). From a normal population, mean scores of 13·1 (Forms A and B combined) on extraversion and 9·8 on neuroticism were obtained. The tendency for students to have high neuroticism scores can be seen in Table 1 and has been noted elsewhere (Child, 1969). The data presented in the manual support another trend shown in the above table; student teachers have relatively high extraversion scores. Further research will be necessary to establish the generality of this finding.

TABLE 1

MEAN SCORES ON PERSONALITY AND STUDY METHOD SCALES.

Scale	University			College of Education		
	Men	Women	Total	Men	Women	Total
(N)	(96)	(43)	(139)	(40)	(78)	(118)
Extraversion	13·0	13·0	13·0	14·4	13·8	14·0
Neuroticism	11·3	14·6	12·3	10·6	13·6	12·6
Motivation	14·3	14·9	14·4	14·5	15·1	14·9
Study Methods	11·9	11·9	11·9	11·2	12·2	11·9
Hours worked (during previous week)						
(a) Total	28·1	29·4	28·5	16·0	20·6	19·0
(b) Morning	7·5	7·7	7·6	3·6	3·2	3·3
(c) Afternoon	10·6	11·7	10·9	4·7	7·5	6·6
(d) Evening	10·1	9·9	10·0	7·6	10·0	9·2

Table 1 shows no differences in motivation or study method scores between college and university. The apparently small number of hours worked by college students in this sample is at least partly explained by a larger number of ' contact hours ' during the day. The separation into hours worked at different times of day confirms this suggestion ; university students admit to doing more independent work during the day but only slightly more in the evening. But the accuracy of this particular measure of ' hours worked ' has yet to be checked.

Correlational analyses.

Scatter diagrams were plotted to provide visual evidence of linearity and homoscedasticity. Where identifiable relationships existed, these appeared to justify the use of the linear correlation co-efficient. None of the relationships was obviously non-linear.

The results are shown separately first by institution (Table 2) and second by sex within institution (Tables 3 and 4), though the number of women in the university sample and of men in the college sample hardly justify this division. Some of the interpretations of the results are, nevertheless, made easier by examining the correlational matrices of the sub-groups.

TABLE 2

CORRELATIONAL MATRIX FOR UNIVERSITY (ABOVE DIAGONAL) AND COLLEGE OF EDUCATION (BELOW DIAGONAL).

	University (N=139)						
	1	2	3	4	5	6	7
1. Criterion	*	·24	·18	·14	·14	—·25	—·11
2. A-levels	·27	*	·01	—·12	·06	—·10	·18
3. Motivation	·22	·09	*	·48	·40	—·16	·14
4. Study Methods	·22	·03	·44	*	·47	—·08	—·21
5. Hours Worked	·04	·10	·31	·49	*	—·11	·15
6. Extraversion	—·11	—·03	·00	—·16	—·28	*	—·17
7. Neuroticism	·02	·11	—·06	—·33	—·04	·03	*

College (N=118)

TABLE 3

Correlational Matrix for Men (Above Diagonal) and Women (Below Diagonal) at University.

	Men (N=96)						
	1	2	3	4	5	6	7
1. Criterion	*	·23	·18	·16	·11	—·21	—·10
2. A-levels	·28	*	—·01	—·14	·02	—·10	·19
3. Motivation	·18	·02	*	·44	·37	—·25	·19
4. Study Methods ..	·10	—·08	·58	*	·40	—·11	—·24
5. Hours Worked	·22	·14	·44	·64	*	—·19	·20
6. Extraversion	—·33	—·10	·04	—·02	·04	*	—·17
7. Neuroticism	—·13	·04	—·04	—·17	·00	—·22	*

Women (N=43).

TABLE 4

Correlational for Men (Above Diagonal) and Women (Below Diagonal) at College of Education.

	Men (N=40)						
	1	2	3	4	5	6	7
1. Criterion	*	—·06	·07	·19	·07	—·01	—·07
2. A-levels	·40	*	·03	—·19	·12	—·05	—·05
3. Motivations	·28	·11	*	·55	·38	·06	—·21
4. Study Method	·23	·14	·38	*	·45	—·11	—·45
5. Hours Worked.	·00	·02	·27	·49	*	—·29	—·28
6. Extraversion	—·14	·00	—·03	—·18	—·26	*	·14
7. Neuroticism	·04	·12	·00	—·35	—·07	·00	*

Women (N=78)

In Table 2 statistical significance at the ·05 level or better can be claimed for correlations of ·17 or more in the university sample and ·18 or more in the college sample. The small numbers clearly limit the strength of any conclusions and, in any case, samples drawn from one university and one college cannot be expected, necessarily, to be representative of any wider population of students. But the relationships which emerge from this study, taken in conjunction with previous findings, can be interpreted with more confidence.

There is fairly close agreement between these results and those obtained with similar scales in Aberdeen (Entwistle and Wilson, 1970). Motivation and study methods are related to academic performance, though the correlations are not consistently significant. The correlation between number of hours worked and attainment just fails to be significant among university students, but is near zero in the college sample. There is further support from these analyses for the mounting evidence that the introvert tends to make a successful student, but no support for the superiority of the neurotic student. As in the Aberdeen study the relationship between neuroticism and academic performance is not significant. The scatter diagram confirmed the lack of relationship: there was no suggestion of non-linearity. An interesting distinction appears in the university sample between correlations with the criterion and with A-level grades. There is a significant positive relationship between neuroticism and these entry qualifications. It is tempting to suggest that the difference in relationship may, in part, be attributable to the element of course work contained in the university assessments. This possibility should at least be borne in mind.

The Aberdeen study had suggested that unstable introverts show higher motivation scores than other personality types, while better study methods are to be found among the stable introverts. The results in Table 2 are in broad agreement with these findings. High motivation at university is related to introversion and to neuroticism. High scores on the study methods scale are related to introversion again, but also to stability. There is a tendency for neurotic introverts to work longer hours than other personality types, but this is only found among university men. In several of these relationships there seems to be indications of sex differences, in particular on the motivation dimension, but the small numbers prevent any firm conclusions from being drawn.

Certain of the relationships are almost completely consistent between college and university samples and it seems reasonable to look at these in more detail. The intercorrelations between the criterion, A-levels, study methods and extraversion show an interesting pattern of relationships. First it is important to know whether the relationships between study methods or introversion and the criterion are independent of previous scholastic attainment (A-levels). The partial correlations, calculated from the university sample, as the criterion is more valid, were as follows:

$$r_{\text{criterion/study methods}} = \cdot 18 \text{ (A-levels constant)}$$

$$r_{\text{criterion/introversion}} = \cdot 23 \text{ (A-levels constant)}$$

Next it seemed important to know whether the relationship between the criterion and introversion remained when both A-levels and study method scores were held constant. It was found that

$$r_{\text{criterion/introversion}} = \cdot 22 \text{ (A-levels and study methods constant).}$$

Finally, although prediction was not the purpose of this study, a multiple correlation was calculated using these three variables as predictors of the first-year marks in university. The value obtained was $r_m = \cdot 36$, a considerable improvement in any of the first order correlations. It must be stressed, however, that the measures of study methods cannot be obtained until students have been in higher education for the best part of a term at the least.

Item analyses.

The development of some of the American scales, mentioned earlier, involved the identification of items which discriminated between successful and unsuccessful students. This procedure has been used in the present study to eliminate weak items, but it also draws attention to the particular types of attitude or behaviour reported by the academically more successful students. The usual approach is limited to the analysis of items against the performance criterion. It was considered interesting to use, in addition, internal criteria based on scores on the four scales—motivation, study methods, extraversion and neuroticism. It is common practice to use this method to check the allocation of items to appropriate scales. But items are rarely ' pure ' ; they often discriminate on more than one dimension. Items derived from the Student Attitudes Questionnaire were found to discriminate not only on the motivation and study methods scales, but also on one or other of the personality dimensions. Similarly, a considerable number of the items from the EPI discriminated on both personality and study methods criteria. By eliminating the irrelevant items from this analysis the relationships between personality and study methods shown by the remaining items become easier to discern.

All 257 students completed the 91 items in the questionnaire and approxmately half of them (allocated randomly) answered each group of 57 items in either Form A or Form B of the EPI. The item analysis thus covered 205 different items and, of these, 67 were found to discriminate effectively between the criterion groups. For the purpose of this analysis the first-year marks, for university and college samples, separately, were divided into three approximately equal groups. The discrimination index for each item was calculated by subtracting the percentage of ' agree ' or ' yes ' responses made by the students with low marks from that made by the group with high marks. As item analyses are seriously affected by sampling errors, the analysis was repeated for sub-groups—first by dividing the total sample into two equivalent halves and then by institution. Only items which discriminated consistently in each sub-group and for which the total discrimination index was 12 per cent or more, were accepted.

Discrimination indices were also calculated against the internal criteria of motivation, study methods, extraversion and neuroticism. For each of these, criterion groups of students scoring high or low on that particular scale were used in calculating the indices and a level of 12 per cent was used as the cut-off when deciding on the item-type. (' Item-type ' indicates the dimensions on which the item discriminates effectively.) As some of the personality items recurred in alternative wording, details of the analysis in the Appendix are given for only 50 of the 67 items. The correlational analysis suggested the superiority of introverts in both study methods and in first-year marks. It was decided to look more closely at the relationships between study methods, personality and academic performance by an analysis of the ' item-types ' of the 67 items which successfully discriminated between good students and poor students. The sign in the ' Marks ' column in the Appendix indicates the answer likely to be given by good students, positive indicating agreement and negative indicating disagreement. By reversing the direction of the item-types for items to which good students tended to give a negative response and then distributing all items into the different study methods and personality categories, it was possible to re-emphasise the importance of both study methods and personality for first-year academic success. Again, good study habits can be seen to go with both introversion and stability ; the summary of this analysis shown in Table 5. 50 of the 67 items were related either to good study methods or to high motivation and, of these, 40 were also related to either stability or to introversion. This analysis suggests a much closer link between study methods and these personality dimensions than was evident from the correlational analysis.

It is also clear from Table 5 that there is a relatively high proportion of items answered positively by good students which are also related to the ' stability ' pole of the neuroticism dimension. This is in spite of the low and contradictory evidence in the correlational analysis where no significant relationship was established. It would appear that certain items in Eysenck's neuroticism scale are negatively related to both good study methods and

TABLE 5

DISTRIBUTION, IN TERMS OF ITEM-TYPE, OF THE ITEMS WHICH IDENTIFIED SUCCESSFUL STUDENTS.

Item identifies	Unstable —	Unstable extravert	— extravert	Stable extravert	— ambivert	Unstable introvert	— introvert	Stable introvert	Stable —	Total
Item type	N, O	N, E	O, E	−N, E	O, O	N, −E	O, −E	−N, −E	−N, O	
*W, O	1	—	—	1	—	—	5	5	12	24
W, M	—	—	—	2	3	1	4	7	7	24
O, M	—	—	—	—	1	1	—	—	—	2
O, O	—	—	1	3	—	3	2	2	1	12
O, −M	—	—	—	4	—	—	—	1	—	5
Total	1	0	1	10	4	5	11	15	20	67

* Note: W indicates discrimination in the direction of high study methods score; M has a similar meaning on the motivation scale. None of the 67 items came into the four other possible motivation and study methods categories.

academic success. The same is true, to a less extent, on the extraversion dimension. Taking the scales as a whole, however, the measured relationship between personality and academic attainment is diminished by a number of items which appear to be irrelevant to the student's experience at university.

Returning to the item-analysis of 50 items reported in the Appendix, it is possible to build up a picture of the 'average' successful student. It may be misleading to try to identify the dominant characteristics of the successful student—clearly no student gives consistently 'correct' responses. But from this analysis an intuitive impression can be built up of a student who plans his work carefully and thinks ahead (items 5, 8, 36), and who is conscientious and recognises the importance of finding conditions suitable for efficient studying (7, 9, 11). There seems to be a certain obsessiveness towards being correct in behaviour (48, 49), which, coupled with independence and self-confidence, ties in with the determination to do things well (1–4). In some people this combination might add up to ruthlessness, but this did not emerge clearly from this analysis. The personality items, in part, could be taken as indicating a liability to be distracted from study either by outside activities (19, 20, 21) or by internal worries (39, 41, 43) among the weak students.

The realisation that good students might give different patterns of response led to a visual analysis of the responses of good and poor students. The low reliability of individual items frustrated this endeavour. It was possible to see that good students would normally have a few 'weak spots' in their behaviour. But it was rare to find a good student having both poor study methods and the 'neurotic' or the 'extravert' personality type. On the other hand, there was some suggestion that for the really outstanding student, neuroticism might be no disadvantage at all. Haggard (1957) has already suggested that some highly intelligent students can utilise neuroticism by increasing their drive towards success.

IV.—DISCUSSION.

The results presented in this report have confirmed and amplified the results obtained previously in Aberdeen. The successful student in both college and university tended to have below average scores on extraversion, together with high scores on the study methods and motivation scales. There was a clear link between good study methods and both introversion and stability, though some highly motivated students had higher scores on neuroticism.

The inter-relationships between personality, study methods and academic performance provide room for much speculation. It appears that stable introverts have good study methods and are also successful students. To what extent is this success attributable to personality or to their methods of study? The results shown here would suggest that good study methods provide only a partial explanation of the introvert's success. Certainly the social life enjoyed by the extraverts and the nagging worries of the emotionally unstable students may well militate against academic success. But these distractions provide only a partial explanation of the relationship between personality and examination performance. There are probably more fundamental effects to consider. Eysenck (1960) and his co-workers have shown the effect of build-up of reactive inhibition on the learning of simple motor skills. For extraverts the detriment in learning efficiency occurs earlier than for introverts. There is still a need to extend Eysenck's work to cover the learning of complex verbal material before any meaningful extrapolations can be made to the academic situation.

The measurements of personality, motivation and study methods reported in this paper suggest that these might be used in student guidance, with a view to reducing 'wastage rates.' At present the correlations are low, though some reached the level of statistical significance even in a small sample. Refinement of the scales should improve their reliability and usefulness. But having identified students with poor study methods, what should be done? Eysenck's work sounds a warning. We cannot assume that the study methods of introverts could be used equally effectively by extraverts, even with careful training. Our knowledge of the interaction between personality, study methods and achievement has not been developed far enough to allow definite suggestions to be made on this problem. It is hoped that additional evidence will be derived from a follow-up study of some 2,700 students from 21 different institutions, which is under way at Lancaster.

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VI.—APPENDIX.

DISCRIMINATION INDICES FOR ITEMS WHICH SHOWED CONSISTENT DIFFERENCES BETWEEN THE RESPONSES OF STUDENTS WITH HIGH MARKS AND THOSE WITH LOW MARKS ON FIRST-YEAR ASSESSMENTS.

Items from the ' Student Attitudes Questionnaire.'

	Discrimination Indices					Item Type
	Mks.	Motiv.	Study	Extra	Neur	
A.—MOTIVATION ITEMS:						
1. I certainly want to pass the exams at the end of this term, but it doesn't matter much if I only just scrape through	–27	–52	–38	– 4	25	–M–W N
2. I hate admitting defeat, even in trivial matters	16	33	11	9	9	M
3. I'm a pretty average student: I'll never be particularly good, so there's no point in striving to be something I'm not	–16	–37	–26	–25	22	–M–W–E N
4. It is very important for me to do well in the courses here	12	40	15	–1	–3	M W
B.—STUDY METHODS ITEMS:						
5. It's difficult for me to organise my study time, at school this was done for me	–31	–6	–54	12	30	–W E N
6. I find it difficult to keep awake during some lectures	–27	–25	–50	8	24	–M–W N
7. It's rather difficult to study, where I am, in the evenings, there are too many distractions	–23	–28	–61	16	28	–M–W E N
8. I usually plan out my week's work in advance whether on paper or in my head	21	27	46	–17	–11	M W–E
9. It's not often I can stick at work for more than an hour at a time	–21	–40	–43	5	15	–M–W N
10. Background music helps me to study more effectively	–21	–17	–22	18	16	–M–W E N
11. I'm rather slow at starting work in the evenings.	–19	–25	–55	7	24	–M–W N
12. I get disheartened and give up easily, if I feel something is difficult for me	–17	–25	–38	–11	31	–M–W N
13. I tend to do less work here than at school	–16	–27	–46	14	17	–M–W E N
14. To pass exams. all that is necessary is a hectic last week of revision	–13	–16	–32	17	7	–M–W E
15. It's useless even trying to find the references we are supposed to follow up	–12	–20	–32	1	14	–M–W N
16. Sometimes I don't take any notes during a lecture, if it doesn't seem to be of much importance	–12	–23	–44	–1	6	–M–W
17. I usually tackle the easy things first and leave the more difficult ones to the end	–12	–6	–44	5	21	–W N
18. I seem to have plenty of free time during the week	–12	–25	–36	11	6	–M–W
C.—EXTRAVERSION ITEMS:						
19. Life is much more fun if you're with a crowd	–15	2	–13	29	8	–W E
20. Sport or social activities take up quite a lot of my time	–14	–7	–18	45	–6	–W E
21. I like to be in the swim of things: if there is anything going on I like to be there	–13	–9	–16	46	10	–W E
D.—NEUROTICISM ITEMS:						
22. My friends seem to think that my moods are unpredictable	–18	6	–22	11	47	–W N
23. I'd never ask a question in a lecture: it would be too much of an ordeal for me	–18	–6	–17	–39	40	–W–E N
24. My friends always seem to be able to do things better than me	–17	23	–10	–16	51	M –E N
25. I seem to spend a lot of time wondering what might happen in the future	–17	5	–28	3	61	–W N
26. I often find that my mind goes blank when I'm faced with a particularly difficult problem	–17	–6	–17	–8	36	–W N

Items from the Eysenck Personality Inventory
(Form A and Form B)

	Discrimination Indices					Item Type
	Mks.	Motiv	Study	Extra	Neur	
E.—EXTRAVERSION ITEMS :						
27. Would you call yourself happy-go-lucky ? (Form B)	–34	–46	–40	58	–6	–M–W E
28. Do you mind selling things or asking people for money for some good cause ? (B)	27	1	–7	–49	14	–E N
29. Are you mostly quiet when you are with other people ? (A)	–20	–12	–13	–60	14	–M–W–E N
30. Do you like going out a lot ? (A)	–18	–9	–16	53	29	–W E N
31. Can you easily get some life into a rather dull party ? (A)	–18	–10	11	53	–27	E–N
32. Can you put your thoughts into words quickly ? (B)	17	–4	–8	69	–32	E–N
33. When people shout at you do you shout back? (A)	–16	–24	–21	43	11	–M–W E
34. Do you generally do and say things quickly without stopping to think ? (A)	–16	–15	–21	40	22	–M–W E N
35. Do you like working alone ? (B)	15	10	14	–6	18	W N
36. Do you like planning things carefully, well ahead of time ? (B)	14	22	21	–30	–24	M W–E–N
37. Are you an easy-going person, not generally bothered about having everything just so ? (B)	–14	–22	–22	47	–16	–M–W E–N
38. Would you do almost anything for a dare ? (A)	–13	–14	–15	49	11	–M–W E
F.—NEUROTICISM ITEMS :						
39. Do ideas run through you head so that you cannot sleep ? (A)	–26	–4	–12	8	38	–W N
40. Are you an irritable person ? (A)	–22	–10	–27	8	71	–W N
41. Are you troubled by aches and pains ? (A)	–21	0	–11	9	49	–E N
42. Do you sometimes get so restless that you cannot sit long in a chair ? (B)	–18	11	–14	19	52	–W E N
43. Do you ever feel 'just miserable' for no good reason ? (A)	–16	–10	–36	–9	45	–W N
44. Have you often felt listless and tired for no good reason ? (B)	–15	31	–4	–21	77	M –E N
45. Do you find it very hard to take no for an answer ? (A)	–14	0	–23	18	32	–W E N
46. Do you often make up your mind too late ? (B)	–14	–8	–17	–8	51	–W N
47. Are you troubled by feelings of inferiority ? (A)	–13	3	–8	–9	76	N
G.—LIE SCALE ITEMS :						
48. Would you always declare everything at the customs, even if you knew that you could never be found out ? (A)	30	15	42	–17	–26	M W–E–N
49. Have you ever been late for an appointment or work ? (A)	–26	–28	–32	–2	14	–M–W N
50. Do you sometimes boast a little ? (B)	14	–7	–1	22	10	E

SUCCESS AND FAILURE AMONG SOCIAL SCIENTISTS AND HEALTH SCIENTISTS AT A TECHNOLOGICAL UNIVERSITY

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SUMMARY. 186 students, 93 per cent of one intake of social and health scientists into the University of Bradford, were classified according to degree result and compared on a number of measures. Performance was found to be positively related to A-level results and inversely to social class background, students from working-class backgrounds being more likely to obtain good degrees. Introversion and open-mindedness appeared to be an advantage in the social sciences, neuroticism in the health sciences. In both fields, the successful tended to score higher on the Nufferno intelligence test. Success in the professionally oriented health sciences was related to strength of occupational motivation. Successful and unsuccessful students differed only slightly in the importance attached to academic goals, and did not differ in reported worries.

I.—INTRODUCTION.

THERE have been many studies of the correlates of academic success. At the university level, no clear-cut picture has yet emerged, but it is possible to make out some points of detail. It seems generally agreed that people who do well in examinations at school also tend to do well in examinations at university (Austwick, 1960; Hawkins, 1967; Pilkington and Harrison, 1967; the Dainton Report, 1968; Maclay, 1968). But the level of correlation tends to be quite low (Drever, 1963) and to vary with subject (Kelsall, 1963). The extent of the association becomes less with the length of time intervening between the respective examinations (Humphreys, 1968; Bagg, 1968).

In general terms, success in examinations, as in many other things, may be said to depend on capacity and inclination (Rodger, 1965). Where a wide ability range has been tested as with American college students (Lavin, 1965) or in the 11+ examination (Vernon, 1963), measured intelligence appears to correlate quite highly with scholastic success. But among the relatively homogenous population of British university students, intelligence tests, even high level tests like the AH5 and the Valentine, have low predictive power (Pilkington and Harrison, 1967).

A number of non-intellectual personality characteristics have been studied in relation to examination success. At the university level, introversion appears to be a favoured trait: introverts, it seems, have a better chance of being accepted (Cattell and Warburton, 1961; Child, 1969); do better in examinations (Bendig, 1960; Furneaux, 1962; Kelvin, Lucas and Ojha, 1965), and are under-represented among dropouts (Wankowski, 1968). The situation with regard to neuroticism is less clear. There are indications that high neuroticism may interact with introversion in examination success (Furneaux, 1962; Kelvin *et al.*, 1965), but according to Wankowski (1968), it is the stable introverts who do best. None of these relationships appears to hold at the school level (Entwistle and Cunningham, 1968).

Another personality characteristic which may be of importance is dogmatism as defined by Rokeach (1960). Among Canadian school leavers (Linton, 1968) and American students, particularly social scientists (Ehrlich, 1961;

White and Alter, 1967), dogmatism has generally been found to correlate negatively with examination performance. But some variation with course content has been reported (Costin, 1965).

Failure at university has been shown to be related to lack of academic motivation (Hopkins, Malleson and Sarnoff, 1958; Maclay, 1968; Wankowski, 1968) and, particularly where professional training is involved, to lack of occupational motivation (Summerskill, 1962). Cohen and Child (1969) in a study of withdrawals from the University of Bradford have found that those from applied science and engineering tended to differ from non-dropouts in being both less inclined to enter a technological university and less satisfied with their career prospects. Dropouts also seemed to find the university environment more worrying.

In addition to capacity and inclination, application is likely to be important. In a study of changing educational values at Bradford, Musgrove (1969) has been able to trace a process of convergence on central academic objectives and de-emphasis of activities not directly rewarded in the examination system. The extent of this academic focusing may distinguish the successful and unsuccessful. Both Malleson (1960) and Maclay (1968) have found that students who do well in examinations tend to stand apart from university social life.

Educational attainment has often been discussed in relation to social class background. It is well established that in the early school years children from non-manual homes are at an advantage, but according to Furneaux (1961) this is no longer true by the time the sixth-form stage is reached. The Robbins Report, which like the Furneaux investigation surveyed a range of universities, indicates a negligible association between performance and social class; and neither Himmelweit and Summerfield (1951) at L.S.E. nor Maclay (1968) at Birmingham could detect a connection. But Dale (1963) has suggested that the proportions from the different classes in a particular institution may be important. Drawing on findings from Cambridge, Oxford and University College, London, he has hypothesised that where it is hard for a student from a working-class background to obtain a place there will be in inverse relationship between social class and performance. In a situation where there is less competition for places, Cohen and Child (1969) found students from manual backgrounds to be over-represented among science and technology dropouts.

At the University of Bradford a longitudinal study was initiated in 1966 among the entering students. In 1969, the first of these students—students in the fields of social sciences and health sciences—graduated. From the measures taken, both on entry and at other times, it is possible to examine a number of factors likely to be relevant to success in these fields. This paper compares (i) students who were awarded a good degree, (ii) students who also graduated and (iii) those who have not yet obtained a degree.

II.—METHODS.

Over 93 per cent of students entering the Schools of Social Sciences, Business Studies, Pharmacy and Optics of the University of Bradford in October, 1966, provided information about themselves and completed a battery of tests and questionnaires under examination conditions. The Registry also made available copies of the students' UCCA application forms. On other occasions during their university careers, these students completed further questionnaires and some of the original ones again.

For the purposes of the present analysis, students from the two schools of the Board of Social Sciences have been designated 'social scientists' and students from the Schools of Pharmacy and Optics as 'health scientists.' The distribution of subjects according to degree results is presented in Table 1. Firsts and upper seconds have been classified as 'good degrees'; lower seconds, thirds and passes as 'other degrees' and failure to graduate as 'no degree.' This last category includes students who withdrew from the University, those who are repeating parts of their courses and those who failed finals. No distinction has been drawn between special honours and general honours courses in pharmacy; the course taken appears to depend as much on career preference as early examination performance. The data of Table 1 show that degree class was largely independent of sex and field of study.

TABLE 1

DISTRIBUTION OF SAMPLE.

Field of Study	Good Degree		Other Degree		No Degree	
	Men	Women	Men	Women	Men	Women
Social Sciences	23	2	45	6	15	3
Health Sciences	10	5	42	18	15	2
Totals..........	40		111		35	

The variables comprising the longitudinal study include a number which may have a bearing on examination success. The social class background and A-level results of the students were obtained from their UCCA application forms and classified according to established criteria (see Tables 2 and 3). Aspects of personality were measured by the Eysenck Personality Inventory (Eysenck and Eysenck, 1964), the Nufferno Level Test (Furneaux, 1956) and Rokeach's (1960) dogmatism scale.

Various measures of motivation were taken. A student's inclination to attend a technological university was estimated from the proportion of his UCCA choices given to the ex-CATs, a half or more being taken as a high CAT-bias. It was also possible to identify students who had not originally applied to Bradford, but had obtained a place through the Clearing Scheme.

Levels of aspiration were measured in the manner devised by Musgrove (1967). Students were given a vertical scale marked off at nine occupational levels and asked to indicate the point they hoped to have reached (i) by the age of 35 and (ii) at the peaks of their careers. Students were also asked to indicate their degree of satisfaction with their present work expectations by ticking one of five statements ranging from "very satisfied; this is the work I really want to do and see myself in" to "very unsatisfied; shall eventually seek a change." Satisfaction with occupational choice was also measured by asking students to indicate (i) the type of work they would ideally like and (ii) the field which, in a likelihood, they would enter. Research-degree orientation was estimated by asking students to tick one of five statements ranging from "I have a very strong desire to stay on at a university for a research degree" to "I am quite sure that I should not wish to stay on for a research degree."

Students' educational values were ascertained by asking them to rate on a five-point scale 25 possible characteristics of the ideal university (Musgrove, 1968a).

All the above measures were taken on entry to the university. At the end of the first term students completed a problem checklist compiled by Musgrove (1968b). In June, 1968, two academic years after entering the University, some of the questionnaires were administered again including the occupational motivation instruments, the educational values questionnaire and the problem checklist.

III.—RESULTS.

Degree result was found to be inversely related to social class background. The data of Table 2 show that among social scientists there was a significant tendency for students from working-class backgrounds to be over-represented among those obtaining good degrees and under-represented among the failures. A similar trend was discernible among health scientists, but the result does not quite reach the 5 per cent level of significance. In both fields of study about twice as many students from non-manual as from manual backgrounds were admitted.

TABLE 2

SOCIAL CLASS BACKGROUND: PERCENTAGE DISTRIBUTION.

Registrar-General's Classes	Per cent			χ^2	P (df 2)
	Good Degree	Other Degree	No Degree		
Social Scientists :					
I—IIIa (N=66)	21·2	54·5	24·2	6·36	·05
IIIb—V (N=26)	38·4	57·8	3·8		
Health Scientists :					
I—IIIa (N=62)	12·9	62·9	24·2	4·87	·1
IIIb—V (N=30)	24·3	70·0	6·7		

TABLE 3

EDUCATIONAL QUALIFICATIONS: PERCENTAGE DISTRIBUTION.

A-levels (UCCA categories)*	Per cent			χ^2 (df 2)
	Good Degree	Other Degree	No Degree	
Social Sciences :				
Good (N=34)	35·3	53·0	11·8	3·07
Not Good (N=57)	21·1	56·1	22·8	
Health Sciences :				
Good (N=18)	27·8	66·7	5·5	3·84
Not Good (N=74)	13·5	64·9	21·6	

* 'good A-levels': any combination of three A-level passes equivalent to or better than CCC, or two A-level passes, AB.

The data of Table 3 show that successful students tended to have better A-level results than unsuccessful students, but the difference is not appreciable. Although the tendency is evident in both fields of study in neither case alone does it reach an acceptable level of significance. When, however, the two sets of results are combined, the difference is significant beyond the 2·5 per cent level.

Certain aspects of personality were found to be related to success, and these varied with field of study. The data of Table 4 show that introversion was significantly related to superior performance in the social sciences, but not in the health sciences. (There is some suggestion that people who failed to get a degree in the health sciences were more extravert than their more successful colleagues, but the difference is not significant.) Conversely, no connection was observed between neuroticism and success in the social sciences, but there was some indication of a positive relationship in the health sciences (for 'good degree' against 'other degree' t=1·55, P<·15; for 'good degree' against 'no degree' t=1·60, P<·15).

TABLE 4

PERSONALITY CHARACTERISTICS: MEAN SCORES.

Variable	Good Degree		Other Degree		No Degree	
	M	SD	M	SD	M	SD
Extraversion:						
Social Sciences	10·17*	3·47	12·21	4·41	13·69	3·70
Health Sciences	11·53	3·42	11·61	3·96	12·44	3·62
Neuroticism:						
Social Sciences	10·12	3·60	10·75	5·31	10·19	5·40
Health Sciences	10·87	4·67	8·80	4·22	8·19	4·68
Intelligence (Nufferno):						
Social Sciences	249·7	65·4	230·5	65·0	230·4	73·1
Health Sciences	286·1	51·4	257·5	70·7	261·7	52·1
Open-mindedness:						
Social Sciences	147·8†	18·6	161·8	24·5	156·2	43·2
Health Sciences	161·2	32·4	164·7	31·4	166·5	21·5

* significantly different from 'other degree' (t=2·14, P<0·05) and 'no degree' (t=3·70, P<0·01).

† significantly different from 'other degree' (t=2·60, P<0·02).

Performance in the health sciences was found to be independent of the level of dogmatism, but in the social sciences, open-mindedness was positively related to success. The high standard deviation of the scores of failures in the social sciences suggests that both the pronouncedly open-minded and closed-minded were at risk.

In both social sciences and health sciences there appears to be an obvious trend for those who scored well on the Nufferno intelligence test to obtain the better degrees, but the differences are not significant. When the mean of all those who obtained good degrees is compared to the mean score of the rest, t=1·78 (P<·1). Health scientists generally obtained higher Nufferno scores than social scientists.

Predisposition to attend a technological university was not related to the class of degree eventually obtained; CAT-bias did not differentiate successful from less successful, or less successful from failure. But there is some indication that those who obtained admission through the Clearing Scheme tended to do less well than those who applied to Bradford in the first place. Of the Clearing Scheme entrants only 13·2 per cent obtained good degrees and 27·0 per cent were among the failures compared to 24·5 per cent and 15·4 per cent respectively of the other students ($\chi^2$4·78, df2, P < ·1).

TABLE 5

SATISFACTION WITH CAREER PROSPECTS ON ENTRY: PERCENTAGES.

Level of Satisfaction with work expectations*	Per cent			χ^2 (df 2)	P
	Good Degree	Other Degree	No Degree		
Social Sciences :					
Very satisfied (N=43)	27·9	53·5	18·6	0·02	NS
Less than very satisfied (N=25)	28·0	52·0	20·0		
Health Sciences :					
Very satisfied (N=54)	22·2	64·9	13·0	9·68	·01
Less than very satisfied (N=29)	0·0	69·0	31·0		

* 26 social scientists and 9 health scientists did not report precise work expectations at this stage.

TABLE 6

CORRESPONDENCE OF IDEAL AND PROBABLE OCCUPATIONAL CHOICES ON ENTRY: PERCENTAGES.

	Per cent			χ^2 (df 2)	P
	Good Degree	Other Degree	No Degree		
Social Sciences :					
Concordant (N=56) ..	25·0	55·3	19·6	0·45	NS
Discrepant (N=34) ..	29·4	56·0	14·7		
Health Sciences :					
Concordant (N=44) ..	25·0	61·4	13·6	5·85	·1
Discrepant (N=44) ..	6·8	70·5	22·7		

Occupational motivation appeared to be related to degree performance among health scientists, but not among social scientists. The data of Table 5 show the relationship for satisfaction with career prospects and Table 6 for the extent of correspondence between ideal and probable occupational choices. On entry, students who eventually obtained a good degree in the health sciences held a higher level of occupational aspiration for age 35 than did the others (Table 7). There was no similar difference among social scientists, but after two years the less successful had developed higher aspirations. Level of aspiration for career-peak was not related to degree performance in either health or social sciences.

TABLE 7

Levels of Aspiration For Age 35: Percentages.

Levels of Aspiration	Per cent Good Degree	 Other Degree	 No Degree	χ^2 (df 2)	P
On entry (1966):					
Social Sciences:					
High* (N=56)	28·6	55·3	16·1	0·16	NS
Low (N=32)	25·0	59·4	15·6		
Health Sciences:					
High* (N=50)	24·0	56·0	20·0	7·09	·05
Low (N=37)	5·4	81·1	13·5		
Change (1966-68)					
Social Sciences:					
Higher (N=32)	33·3	68·4	—	6·14	·05
Lower (N=12)	33·3	15·8	—		
Same (N=12)	33·3	15·8	—		
Health Sciences:					
Higher (N=31)	58·3	51·1	—	1·19	NS
Lower (N=11)	25·0	17·0	—		
Same (N=17) ...	16·7	31·9	—		

* Levels 5–9.

The extent of convergence on academic aspects of a university education appears to be only slightly related to degree success. Of the six indicators listed by Musgrove (1969), only the importance attached to ' good community spirit ' differentiated successful and less successful. Significantly more of the former attached less importance to this item after two years in the university ($X^2$5·33 df1, $P < ·025$). In addition, the successful tended to attach relatively more importance after two years to the presence of "distinguished scientists and scholars who are well known for their research" ($X^2$3·49, df1, $P < ·1$).

The successful and less successful did not differ in their desire to pursue post-graduate work for a research degree either on entry or after two years. Those who failed to obtained a degree did not report any more problems than those who obtained a degree; neither was class of degree important in this respect.

IV.—DISCUSSION.

The present enquiry indicates that academically successful students differ from the less successful in ways other than just the ability to do well in examintions. Among social scientists and health scientists at the University of Bradford, differences were found in social class background, aspects of personality and, in the case of the professionally oriented health science courses, differences in occupational motivation.

In the sample studied, the students who did well tended to be better qualified on entry and more intelligent according to the Nufferno test. The first observation accords with much previous research ; the second probably reflects the relatively wide ability range entering a technological university. The tendency of social scientists to do less well on the Nufferno test than students from natural science backgrounds has been discussed by Child (1969).

Successful and unsuccessful students appear to differ in personality characteristics, the differences varying with field of study. Introversion among social scientists and neuroticism among the generally more stable health scientists appeared to be favoured traits. Also among social scientists, but not health scientists, open-mindedness appeared to correlate with success. According to Rokeach (1960), the crucial difference between the open-and closed-minded is the inability of the latter to synthesise new cognitive systems. It is possible that the social sciences with their conceptual emphasis are more demanding of this ability than the health sciences.

In the health sciences, where there is a relatively clear-cut relation between courses and career opportunities, the occupational motivation of the students assumes importance. Successful students in this field tended to enter university with higher levels of aspiration, to be generally very satisfied with their career prospects, and to be confident of getting the jobs they ideally wanted. In the social sciences there were no such differences at the outset, but during two years the less successful tended to develop higher levels of aspiration (perhaps by way of compensation).

The present enquiry differs from a number of other studies in finding a relationship between social class background and academic success at university. In both fields of study, in terms of both outright failure and degree class, students from working-class backgrounds tended to be the more successful. This contrasts with the finding of Cohen and Child (1969) that among the 1966 intake of applied scientists and technologists into the University of Bradford, students from manual backgrounds were over-represented among the dropouts. The social science and health science schools resemble each other, but differ from the applied science and technology schools, in accepting a high proportion of students from non-manual backgrounds. Taken together these observations lend support to Dale's (1963) hypothesis that where the bias against a working-class student is relatively high, achievement will be inversely related to social class background.

Successful and unsuccessful students did not appear to differ in their ease of adjustment to the university environment. Neither did they differ much in the relative importance which they attached to academic activities. This may mean that focusing down on academic work is unrelated to examination success. Other British studies have generally failed to detect a relationship between study habits (including length of time spent studying) and examination success, although some connection has been reported in America (Cooper and Foy, 1969).

The subjects of the present enquiry were on three-year courses. In 1970, their colleagues in applied science and engineering on four-year sandwich courses will be graduating. A second paper will report on correlates of success among these students.

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CREATIVITY, VISUAL IMAGINATION AND SUGGESTIBILITY: THEIR RELATIONSHIP IN A GROUP OF 10-YEAR-OLD CHILDREN

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SUMMARY. An experiment is described in which 147 10-year-old children were tested for their creative ability. The same children were then placed in an experimental situation and exposed to peer suggestion. Results show that those children who were highly creative were very open to suggestion. Those measured high on visual imagination were not. It is concluded that by the nature of the creativity process itself, creative people are suggestible.

I.—INTRODUCTION.

THE personality characteristics of creative individuals have been given considerable attention in psychological literature. Torrance (1962) compiled a list of 86 traits mentioned in studies of the creative personality. Many writers (Barron, 1958; Ghiselin, 1962; Houston and Mednick, 1963) believe that there is an openness on the part of the creative individual to novelty and to what others have thought and believed. The view of Thurstone (1952) is a good example. He uses the term 'gullibility' to refer to this trait in the syndrome of the creatively talented person.

To say that the creatively talented are gullible is to say that they are suggestible in the sense that the word is most often used in psychology. The present investigation sets out to explore the relationship between creativity and suggestibility.

MacKinnon (1962a) has carried out an investigation with a group of creative individuals, using the Asch 'lines' situation, and he reports that the creatively talented are definitely not suggestible individuals. In the Asch experiment they asserted themselves when under social pressure and refused to agree with the opinions of others in their experimental groups.

MacKinnon used 40 of the most successful architects in the United States as his creative subjects. They were mature men whose success in their careers had probably reinforced them in their opinions about other matters too. MacKinnon (1962b) reports that they tended to have a good opinion of themselves as evidenced by the large number of favourable adjectives which they used in self-description and " by the relatively high scores which they earn on a scale which measures basic acceptance of the self."

MacKinnon's sample of subjects was biased because he used creative men whose talents had brought them success and his findings could by no means be generalised to all creative people. If other creative individuals could be identified who were less sure of their own worth, possibly we would find that these people are open to the new idea even when it is suggested by the pressure of a peer group. It was felt that creative children would make ideal subjects for such an investigation.

An hypothesis was derived from these considerations. It stated that: " Those children who are shown to be highly creative by their scores on the Uses for Objects Test and the Word Association Test (Guilford, 1956) are more open to suggestion in a situation of social pressure than those children who are similarly shown to be low in creativity."

II.—METHOD.

School children whose ages ranged from 9 years 5 months to 10 years 6 months were chosen for this study. The average age of the group was 9 years 11 months. There were 147 children available of whom 79 were girls and 68 were boys.

Creativity testing.

The experiment was conducted in three separate sessions. During the first session two of the tests devised by Guilford (1956) were administered, the Uses for Objects Test and the Word Association Test. These tests were scored for quality and statistical infrequency of response.

Visual Imagination testing.

One week after the first session the same children were shown slides of dark shapes (see Figure 1). These shapes are ' nonsense ' shapes in the same sense as we use the term in reference to ' nonsense ' syllables. Information about how they may be constructed appears in an article by Attneave and Arnoult (1956). The slides of shapes were projected on to a screen about four feet square for 30 seconds each. Subjects were given the following instructions orally : " I am about to show you some dark shapes on the screen here. I want you to write down what each of these dark shapes looks like. The funny thing is that they look different to different people. As well as this, some of them look like something to some people but do not look like anything to other people. As I show you each shape, I want you to write down what it looks like to you. I do not want you to write anything at all if you feel that the shape does not look like anything. You may write one word, maybe two ; perhaps one sentence or a whole lot of sentences." Responses to the slides were scored in the same way as responses to the two Guilford tests.

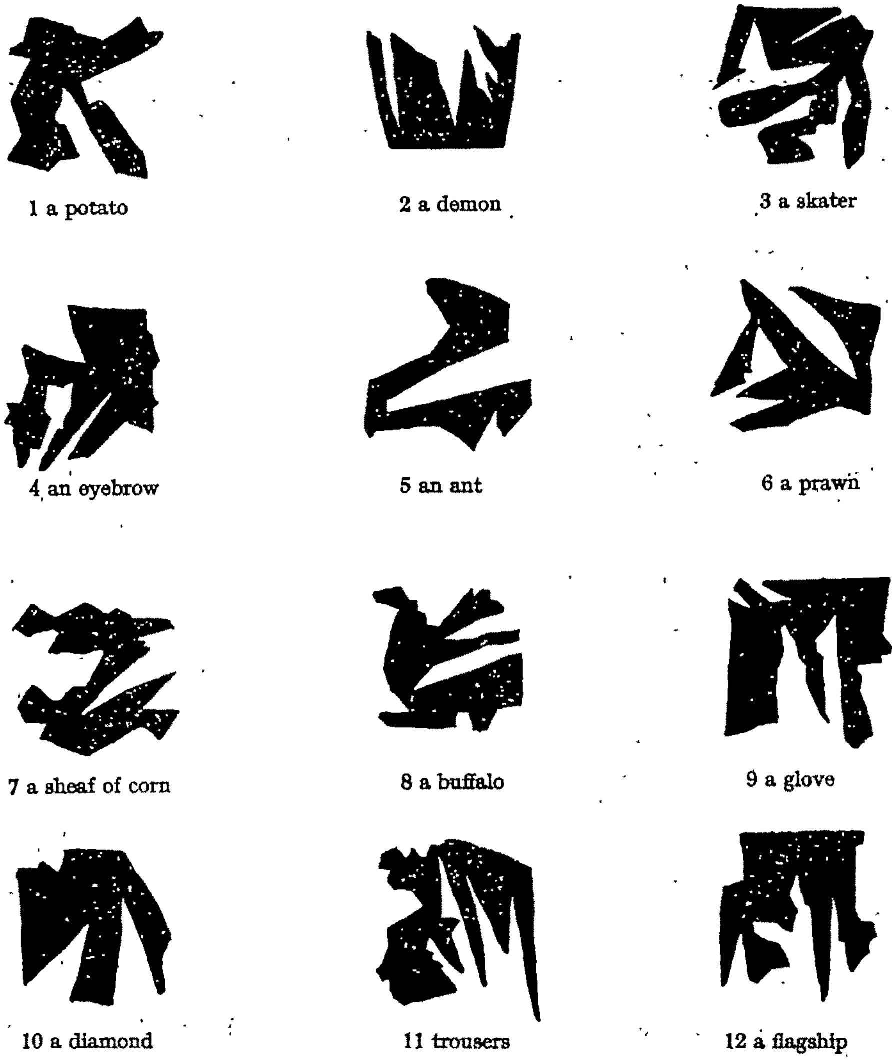
No hypothesis was made about visual imagination ability and its relationship to the other two variables, creativity and suggestibility, which were being investigated. However, a discussion of the findings from this part of the experiment and of the relationship of visual imagination scores to scores on the other two measures appears later in this article.

Suggestibility test.

The third experimental session took place exactly five weeks after the second, and was in two parts. 98 children were used in the first part. The materials used were the slides of shapes which the children had seen in the visual imagination test. In this first part of the third session, as each slide was shown, a suggestion was made by the experimenter about what it looked like. This opinion about the shape was said to have been given by a majority of the group in their responses of about one month before. In fact, the suggestion had been selected randomly from common nouns listed in the first section of the Thorndike-Lorge (1952) word frequency lists. The randomly assigned names are given in Figure 1. Instructions were given orally to the class : " Today I am going to show you those slides of dark shapes which I showed you last time I was here.

FIGURE 1

The random figures in the order in which they were presented in the visual imagination and suggestibility sessions. Their 'names,' randomly assigned for the purposes of the suggestibility session, are given.



1 a potato

2 a demon

3 a skater

4 an eyebrow

5 an ant

6 a prawn

7 a sheaf of corn

8 a buffalo

9 a glove

10 a diamond

11 trousers

12 a flagship

I have been looking at the answers which you all gave last time and I was very pleased. This time when I show you the slides I am going to tell you what most of you thought the shapes looked like last time. This time I want to see whether or not you yourself agree with what the majority thought last time. If the shape looks to you like what I call out, then I want you to write that down. For example, if I were to show you the first shape and to say that most of you thought it was a cow last time, this time I would want you to look hard at it and to decide whether or not you think it is a cow (or whatever it is that I call out). It does not matter what you wrote last time. You are allowed to change your mind. If you think now that it looks like the thing which I call out, write that down. If, however, you think that it looks like something different from what I call out, then write down what you think the shape looks like. If you do not think that the shape looks like anything at all, then just draw a line on the paper. Thus when you see a shape you will do one of three things. You will write down what I call out if you think it looks like that. You will write down something different if you think that it looks different from what I call out. You will draw a line if it does not look like anything at all."

As before, long and repetitive instructions were given in order to ensure that each child knew exactly what was required of him. The score for suggestibility was simply the number of suggested items which a child wrote down. The maximum suggestibility score was 12 items.

Memory test.

It was felt that if a high percentage of children demonstrated that they could remember correctly what they had written about the slides five weeks previously, then the results of the suggestibility experiment must be contaminated. Accordingly, a second part of the third experimental session, in which about a quarter of the subjects took part, was a memory test. This test was conducted five weeks after session two, the visual imagination test. Those children involved in the memory test were shown the slides once more and on this occasion were asked if they could remember what they had thought each slide looked like the last time they saw it. The score for this test was the number of items that a child could recall correctly from the testing session which had taken place over one month before.

III.—RESULTS.

Table 1 shows that there are highly significant correlations between measures of creativity and suggestibility. The correlations between these measures and the measure of visual imagination are only significant in the case of visual imagination and suggestibility. It will be noted that there is a higher correlation between suggestibility and each of the creativity measures than there is between the two creativity measures themselves. This is the sort of finding Guilford (1956) leads us to expect when we deal with intellectual abilities. It is reasonable to suggest that the two tests of creativeness used here measure abilities which fall on either side of the general factor of creativity.

TABLE 1

CORRELATION MATRIX OF THE MEASURES OF CREATIVITY, VISUAL IMAGINATION AND SUGGESTIBILITY.

Measures	No.	1	2	3	4
Uses for Objects Test ..	1				
Word Association Test..	2	·46**			
Visual Imagination Test	3	·16	·18		
Suggestibility Test	4	·62**	·51**	·23*	

* P ·02 ** P ·001

TABLE 2

ANALYSIS OF VARIANCE: SUGGESTIBILITY SCORES.

Source	Sum of Squares	df	Mean Square	F
Visual imagination (A)	0·1	1	0·1	0·2
Creativity (B)	72·9	1	72·9	145·8 (P<·001)
A X B	4·5	1	4·5	9·0 (P<·01)
Error within cells	18·0	36	0·5	

Further evidence of the relationship expressed by the coefficients of correlation is given in Table 2. An analysis of variance was carried out using the suggestibility scores of four groups of children. The groups selected were (1) those who had high scores on both visual imagination and on creativity measures; (2) those who had high scores on visual imagination but low scores on creativity; (3) those who had low scores on visual imagination but high scores on creativity; (4) those who had low scores on both measures. Each group comprised 10 scores. This analysis of variance of suggestibility shows that the effect of creativity is highly significant. Again there is evidence of a slight interaction between creativity and visual imagination in the extent to which they affect the suggestibility process. These results showing a simple effect for creativity support the hypothesis.

The results of the memory test are not tabulated. They showed that over 80 per cent of the children tested could not remember a single response that they had made in the visual imagination test. Some remembered one response and three of the children remembered two responses. It was felt that the effects of memory could be disregarded as a contaminating factor in the suggestibility situation.

IV.—DISCUSSION.

Creativity and visual imagination.

It is worth discussing briefly the relationship between creativity and visual imagination as indicated by this study. Some support for the finding that there is a low correlation between the two abilities may be derived from earlier studies. Schmeidler (1965) identified a group of creative people and was 'baffled' to find that many were markedly low in their visual imagination ability. Francis Galton's (1907) similar findings are relevant. He wrote that visual imagination was 'starved by disuse' among philosophers and was also very weak among the majority of scientists.

It has been stated (Mednick, 1963) that the relationship may be a matter of cognitive style. Some creatively talented people may prefer to call up visual images when attempting to solve a problem. Others, Mednick feels, may explore the problem by the use of words. Accordingly, there are problems best solved by the visualiser and others best solved by the verbaliser.

In this experiment the two creativity measures were probably more biased in favour of subjects preferring verbal solutions to the problems posed than to subjects preferring visual solutions.

Creativity and suggestibility.

It seems a paradox to think of the creative person as suggestible and conforming. It is one of the hallmarks of creativity that it often goes beyond the tenets, attitudes and mores of our culture. However, some work by Piaget (1954) hints that the clear relationship between creativity and suggestibility indicated by the present finding is to some extent a function of the age of the subjects. In his programme of social development of the child, Piaget implies that the way in which a child learns ' the rules of the game ' shows a curvilinear relationship between age and conformity. At an early age a child is uninfluenced by rules but gradually begins to follow them until, at about age 10 or 11, the rules are internalised and carried out to the letter. After this stage the child begins slowly to express individual modes of response by creating and codifying certain of his own rules.

In an experiment which used a wide age range, Costanzo and Shaw (1966) showed that there is a relationship between age and conformity up to age 14. These investigators state that, at about 10 to 12 years old the children display much uncertainty about their own judgments and mirror judgments of their peers. They then change : " by the post-adolescent and early adulthood stages, the individual has learned that there are both situations which call for conformity and those which call for individual action. Thus, he becomes more confident about his own judgments despite the disagreement of a unanimous majority " (p. 973). So the creative child probably becomes much less suggestible by his mid-teens.

The present finding has implications for the educational system. The same trait that makes the creative child suggestible gives him the ability to pick up a new idea. In the present study creative children were very willing to assign a secondary role to their own ideas about the figures. Just as the creative child picked up the suggested ideas, he has undoubtedly picked up others and probably has a store of such ideas ready to be tapped when the occasion demands. It is this store which marks the superiority of such a child in the situation requiring creativity.

If the creative child retains the ability to pick up new ideas and the ability to store them, during adolescence and adulthood, it improves his ability to be creative. These ideas become raw material for use when faced with a problem. Wallach and Kogan (1965) place great emphasis on the creative person's store. They state : " If we assess a person's capacity to generate cognitive elements, one factor influencing his performance as a ceiling or upper bound is the extensiveness of his repertoire" (p. 15). The present finding answers a question ignored by Wallach and Kogan. This study identifies that trait which allows the creative individual to pick up new ideas in the first instance.

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LEVEL OF CHILDREN'S PLAY AS EXPRESSED IN GROUP SIZE

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SUMMARY. From the initially plausible general conception that the level of playing games which children are able to attain is positively correlated with their actual level of intellectual abilities and social skills, it was deduced that there should be a positive correlation between group size in children's games, on the one hand, and their age and socio-economic status, on the other. Two specific hypotheses were formulated to this effect. These hypotheses were tested through processing recordings of observations of over 6,000 Israeli children at play. The observations lasted for over one year and the cumulative total of players recorded amounted to more than 100,000 participants. It was found that group size tends to increase with both age and socio-economic level and that the most frequent group size is two, with the exception of top grade high socio-economic level children, for whom the dominant group size is four.

I.—INTRODUCTION.

DURING a large scale investigation we have recently conducted on the structure and modes of organisation of school children's freely formed, unsupervised play groups (Eifermann, in press), we have been able to come up with rather detailed observations regarding the size of those groups, which we think should be of direct importance for testing the validity of some current conceptions on the relation between size of play groups and age. Our own data enable us to formulate and test rather precise hypotheses as to this relationship, as well as the relationship between size and social status which, to our knowledge, has not been discussed previously at all.

It sounds initially plausible that the level of playing children are able to attain should stand in some correlation with their actual level of intellectual abilities and social skills. A higher level of play should express itself, amongst other factors, in a larger size of the play group. Hence, there should be some positive correlation between group size on the one hand, and age and socio-economic status, on the other. All this is based on the assumption that there are no special motives that will cause children to behave in play at a considerably different level than in their other activities in the formal school setting.

In our investigation, we were not concerned with the level of performance of individual children, but rather with comparisons between different age groups (6 to 14) and different status and culture groups. Our observations were conducted both at school, during recess and out of school, in streets and improvised play fields, in the neighbourhood of two of ' our ' schools. Thus far only the school observations have been processed and analysed with respect to size, and this paper will report on the results of some of these analyses. The one exception is an analysis of mean group size conducted on a sample of the recordings made out of school. The mean group size obtained, viz. 3·9, is exactly that obtained in the corresponding analysis of the observations conducted in that neighbourhood school. While the obvious limitations of the play situation at school should nevertheless be kept in mind, it is perhaps also pertinent to point out that with regard to a number of variables already compared (e g., the type and variety of games played, even the average length of the period of uninterrupted playing), play at school and out of it exhibit, perhaps surprisingly, remarkable similarities (see Eifermann, *op. cit.*).

After preliminary investigations (discussed in *School Children's Games*, mimeographed report presented to the US Department of Health, Education and Welfare, Bureau of Research, June, 1968) and, somewhat to our surprise, it turned out that the rather gross index of group size by itself could serve as a base for our analyses. There was no need to take into account either more complex indices such as extent or level of interaction that takes place during play, or a more detailed classification of the games played into, say, rule-governed games, competitive games, etc. Some important results obtained from these more detailed classifications could as well be obtained from looking-just at this gross index itself, which is so much more open to straightforward observation, easy to record and far more economical to analyse.

(i) *Size and age.*

There is some evidence available to show that amongst pre-school children engagement in isolated play decreases with age while there is a corresponding increase in group play (Parten and Newhall, 1943; Green, 1933). Furthermore, Bühler (1933) quotes some findings to the effect that while young kindergarteners, when playing in groups, do so primarily just in pairs, groups of three predominate during the late pre-school period. These findings have been interpreted to mean (Hare, 1962; Munn, 1966; Millar, 1968) that increasing maturity permits effective participation in group activity, as well as in increasingly larger groups. While we accept these interpretations as a general starting point, various issues remain to be clarified in order to lend it further support and to determine it more precisely.

First, it should be pointed out that the findings on which these interpretations lean are based on small, probably inadequate samples. Secondly, they refer to observations conducted only on kindergarten children. Thirdly, only Bühler actually claims that the size of the predominant play group increases absolutely (from two to three participants) with age, whereas there exist some related findings by James (1953), which go counter to Bühler's claim. James, who recorded free-forming small groups of adults, as well as of children, at play, work, conversation and other activities, has found that groups sized two are more frequent than groups of larger size and that, altogether, an inverse relationship exists between group size and its frequency of occurrence. A recalculation of his data in terms of per cent participants in each group size, rather than by number of groups, produced the same inverse relationship.

Rather than expect an increase in absolute size of the predominant play group, the following, more cautious hypothesis, should be put forward:

Hypothesis 1: The proportion of players (aged 6–14) in the smaller-sized groups decreases in inverse relationship to their age.

(ii) *Size and socio-economic level.*

No investigations have been undertaken, to the best of our knowledge, in which the size of play groups of children of different socio-economic levels were compared. Yet such a comparison may be particularly revealing. Two opposing possibilities are conceivable: low-status children (' low ') may turn out to play, on the average, in groups of size at least equal to that of high-status (' high '). Research on gangs may be considered to lend at least some indirect support to this possibility. This research indicates (in particular, Thrasher, 1936), that youth of low-status groups practise various forms of organised ' togetherness,' in relatively large groups. On the other hand, our own findings on children's play activities (Eifermann, *op. cit.*) show that, according to a number of indices, ' low ' children reach the level of performance of ' high ' children at a later chronological age. (For example, the proportion of 'low' children participating in rule-governed games, as opposed to unstructured play, is smaller than that of 'high' children in the lower school grades.) These findings may suggest that with regard to group size a corresponding gap between the two status groups may exist. The following hypothesis may then be put forward:

Hypothesis 2: The proportion of children of low socio-economic status who play in smaller-sized groups is greater than that of children of high socio-economic status of the same age.

It is just conceivable that such a difference, if found, could be due to the fact that some of the games included in the computations were observed exclusively in either 'high' or 'low' schools, and that this fact is a product of cultural rather than developmental factors. In order to check on this possibility, we decided to test hypothesis 2, if confirmed with regard to all players, also on players of only those games which were observed in both types of school.

II.—METHOD.

(i) *The sample.*

Our sample consisted of the pupils of 14 Israeli primary schools situated in all parts of the country. Seven of the schools were of high and seven of low socio-economic level, as measured by a weighting of the following variables: parents' educational level; father's occupation; family size and number of rooms occupied by family; parents' country of origin and year of immigration (if immigrants). On the basis of this information the mean socio-economic level was calculated for each school, on a nine-point scale (0 to 8). The range obtained for the 'low' schools was between 0·47 and 2·83 whereas the range for the 'high' schools varied from 4·53 to 6·11. The level of school achievement for each school was the mean of the scores obtained on State School Examinations by all eighth-grade pupils of the two school years during which our investigation took place. The scores for the 'low' schools ranged from 61 to 66, while the scores for the 'high' schools ranged from 73·5 to 83, on a 40–100 point scale. In the selection of the two types of school, great care was taken to avoid any systematic differences in layout, space or facilities available. Moreover, in none of them were there restricted play areas for younger or older children.

Recordings of all play groups in the 14 schools were conducted once a week throughout a 10-minute recess period. The field work lasted from January/February, 1965, through to March, 1966, excluding periods of school holidays. The total number of children in the sample was 6,242 during the 1964/65 school year and 6,211 in the 1965/66 school year. Of course, grade 1 of the second year of the study was not part of the sample of the first year, while the eighth grade of the first year was not part of the second year's sample. The number of pupils in all 'low' schools was 3,325 in 1965 and 3,391 in 1965/66. In all 'high' schools the respective numbers were 2,917 and 2,820. The cumulative record of play participants during the complete period of observation was 104,854—51,552 and 53,302 in the 'high' and 'low' schools, respectively.

(ii) *Method of observation.*

A more detailed description of the method appears in another publication (Eifermann, *op. cit.*). The most relevant essentials for our present discussion are as follows: Observations were conducted in the yards and buildings of each school. The team of observers in every school consisted of an average of nine observers who were local teachers, except for two schools, one ' high ' and one ' low,' in which the same team of university psychology students served as observers. In addition to the observers, there was also a local co-ordinator as well as a supervising contact-man from our centre in Jerusalem. Such a contact-man was present in every school on each day of observation.

The method of observation stipulated that the area observed in each school be so subdivided that each observer cover a section on which five groups on the average would play during the recess period. Amongst the variables recorded about each group were its size and its composition by grade and sex, the ethnic or religious affiliation of the participants, the length of the game, incidence of quarrel, the type of ground surface and buildings in which the game took place, and the name of the game. Descriptions of all play activities were also collected mainly through separate interviews. In every school, inter-judge reliability tests were conducted on four occasions. The independent recordings of the same play space by pairs of observers were compared. The mean percentage agreement between observers on the four tests for *number of play participants in each group* recorded was 81·6 for the ' high ' schools and 89·0 for the ' low ' schools, ranging from 61·3 to 94·6, and from 78·5 to 97·7, in the various ' high' and ' low ' schools respectively. In two-thirds of all of these cases the extent of disagreement between observers was limited to just one player, while most disagreements occurred in recordings of the larger sized groups. Mean percentage agreement between observers on the variable *grade* was 91·9 in the ' high' schools, and 94·7 in the ' low ' schools, ranging between 87·1 and 95·2 in the various ' high ' schools, and between 88·2 and 99·0 in the various ' low ' schools. The mean percentage agreement on number of players, and on grade, over all schools was 85·4 and 93·4 respectively. (It will be realised that the percentage of incorrect observations is approximately half that of the percentage of observations that are in disagreement.)

III.—RESULTS.

Table 1 gives the total number of children in pairs of successive school grades who played in groups sized 2–3, 4–5, etc., up to 46–47, the largest group observed. The original analysis referred to groups sized 2, sized 3, etc. When we decided, for the final analysis, to group together groups of sizes 2 and 3, of sizes 4 and 5, etc., this was done because the original curve showed an almost completely systematic zig-zag shape indicating that another strong factor was involved, namely, the evenness and oddness of the group size. Neither is it difficult to account for this factor; it is introduced mainly, though perhaps not exclusively, through the fact that in competitive two-group games the two groups tend to have an equal number of members. We intend to deal with this factor on some other occasion. For our purposes, we decided to smooth it out by combining the 2n with 2n+1 sizes, for each n.

The percentages of children playing in groups of these varying sizes out of their respective totals in the specified grades are also presented in Table 1. (Notice that the percentages are those of players and not of play groups; the groups, of course, were not necessarily composed of children of the same grade.) Figure 1 shows the percentage data in graph form up to group size 28 (only a very small portion of all play participants were involved in groups of still larger size). It may be seen from these data that the percentage of children who play in small-sized groups is indeed smaller the older they are. These

TABLE 1

Total Number of Play Participants, By School Grade and Play Group Size. Percentage Out of Total in Each Pair of Grades. (N = 104,854).

Group Size	Number of Participants in Grades				Percentage of Participants in Grades			
	1–2	3–4	5–6	7–8	1–2	3–4	5–6	7–8
2–3	9549	10262	6799	4145	34·0	31·6	25·1	24·0
4–5	7633	7850	5660	3436	27·2	24·2	20·9	19·9
6–7	4462	5090	4239	2374	15·9	15·7	15·7	13·7
8–9	2690	3390	3125	1747	9·6	10·5	11·6	10·1
10–11	1403	2080	1879	1608	5·0	6·4	6·9	9·3
12–13	962	1118	1496	1147	3·4	3·4	5·5	6·6
14–15	408	914,	1125	912	1·5	2·8	4·2	5·3
16–17	366	597	865	514	1·3	1·8	3·2	3·0
18–19	77	323	472	303	0·3	1·0	1·7	1·8
20–21	117	198	450	265	0·4	0·6	1·7	1·5
22–23	70	209	191	158	0·2	0·6	0·7	0·9
24–25	131	67	97	120	0·5	0·2	0·4	0·7
26–27	60	40	91	100	0·2	0·1	0·3	0·6
28–29	36	15	199	92	0·1	0·0	0·7	0·5
30–31	32	85	103	201	0·1	0·3	0·4	1·2
32–33	41	26	27	35	0·1	0·1	0·1	0·2
34–35	11	44	116	2	0·0	0·1	0·4	0·0
36–37	2	45	39	22	0·0	0·1	0·1	0·1
38–39	8	30	0	0	0·0	0·1	0·0	0·0
40–41	5	7	53	55	0·0	0·0	0·2	0·3
42–43	0	14	12	17	0·0	0·0	0·0	0·1
44–45	27	17	0	0	0·1	0·1	0·0	0·0
46–47	8	6	13	20	0·0	0·0	0·0	0·1

results are, moreover, highly consistent. (Because of the very large size of the sample, no statistical tests of significance were deemed necessary.)

The second hypothesis was that the proportion of ' low ' children who play in the smaller sized groups is greater than that of ' high ' children. Table 2 gives the total number of children who played in groups of 2–3, 4–5 . . . 46–47 separately for the ' high ' and for the ' low ' schools. Figure 2 presents these percentages graphically.

It may be seen that the percentage of children in ' low ' schools who played in groups up to and including size 4–5 is greater than their percentage in the ' high ' schools. In groups sized 6–7 this relationship is significantly reversed ($P < \cdot 01$, as indicated by a test of significance of differences between proportions between independent samples). Indeed, beyond that size it is in practically all cases the children from the ' high ' schools whose percentage play participation is the greater. As can be seen from Table 3, the corresponding analysis, conducted only on players of games which were recorded in at least one ' high ' and one ' low ' school, revealed exactly the same trends, though the relevant statistical analysis shows that in groups sized 6–7 the reversed relationship does not quite reach significance level.

Our data enabled us to put to test the above mentioned claim made by James, to the effect that there is an inverse relationship between group size and its frequency of occurrence. Indeed, the data presented in Tables 2 and 3 show that in our whole sample there is a systematic decline in the per cent of

FIGURE 1

Percentages of Play Participants in Different Sizes of Group, By School Grade.

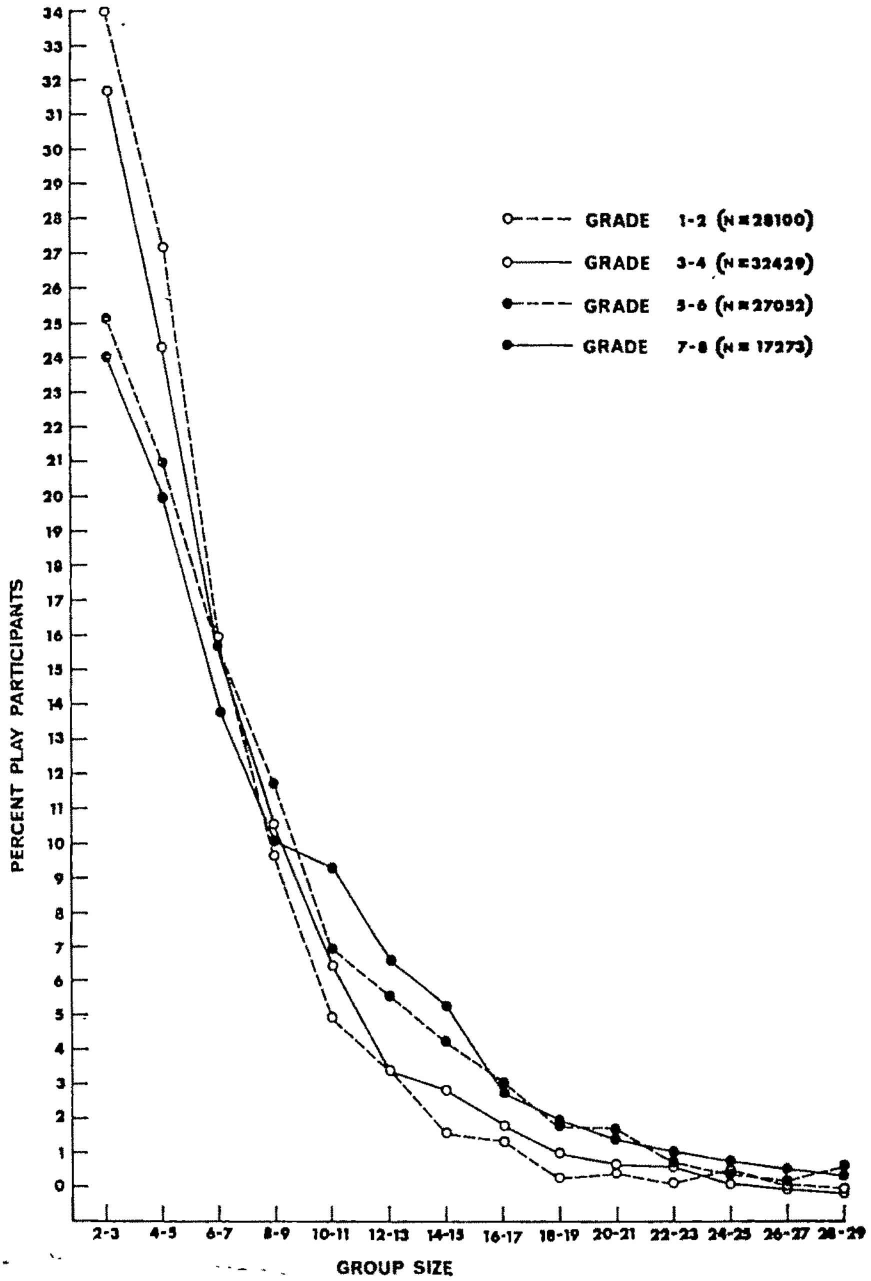

FIGURE 2

PERCENTAGES OF PLAY PARTICIPANTS IN DIFFERENT SIZES OF GROUP IN SCHOOLS OF HIGH AND LOW SOCIO-ECONOMIC STATUS.

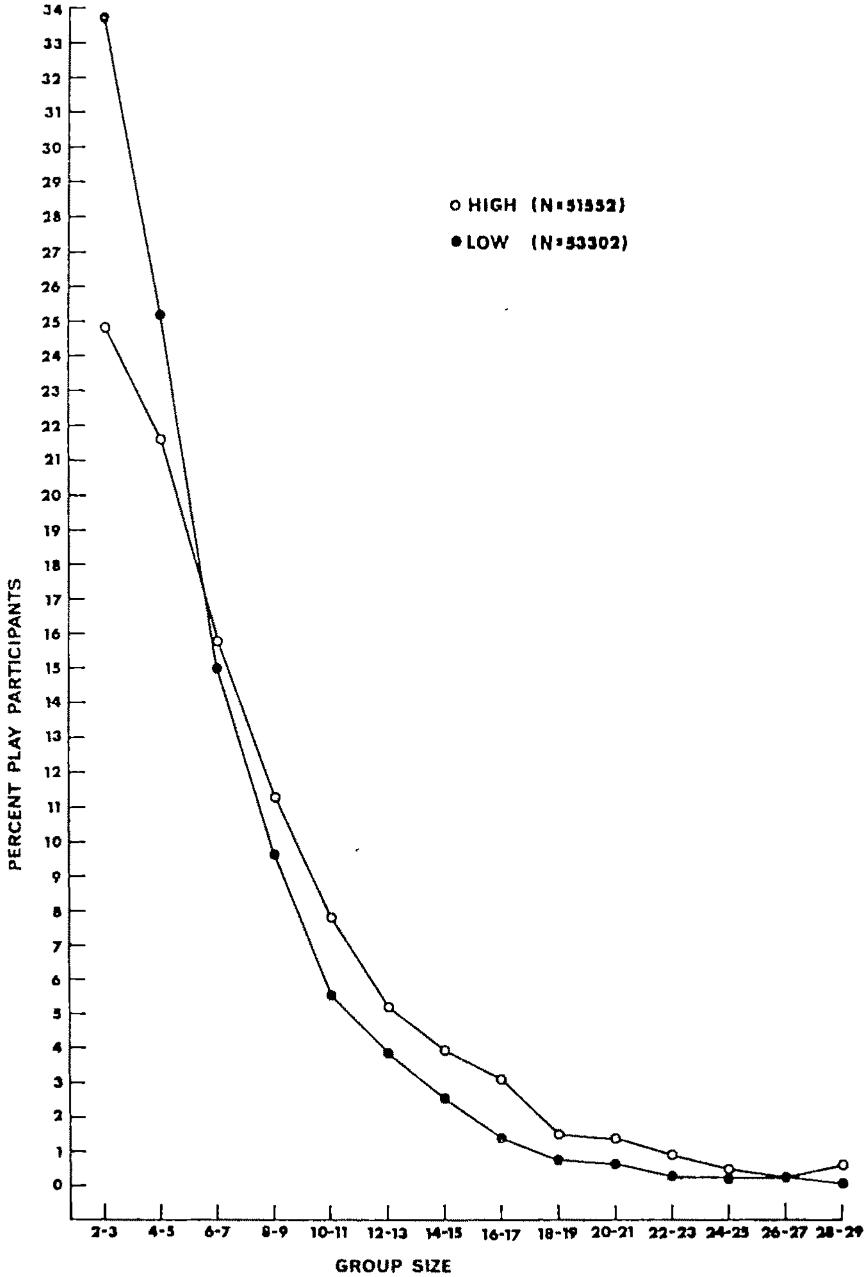

TABLE 2

Number of Play Participants in 'High' and 'Low' Schools, by Play Group Size. Percentage Out of Total Number of Players in Each Type of School. (N 'High' Schools=51,552; 'Low' Schools=53,302).

School Level	'High'		'Low'	
Group Size	Number of Players	% of Players	Number of Players	% of Players
2–3	12771	24·8	17984	33·7
4–5	11159	21·6	13420	25·2
6–7	8160	15·8	8005	15·0
8–9	5840	11·3	5112	9·6
10–11	4031	7·8	2939	5·5
12–13	2693	5·2	2030	3·8
14–15	2017	3·9	1342	2·5
16–17	1577	3·1	765	1·4
18–19	790	1·5	385	0·7
20–21	727	1·4	303	0·6
22–23	450	0·9	178	0·3
24–25	245	0·5	170	0·3
26–27	133	0·3	158	0·3
28–29	285	0·6	57	0·1
30–31	301	0·6	120	0·2
32–33	33	0·1	96	0·2
34–35	104	0·2	69	0·1
36–37	72	0·1	36	0·1
38–39	38	0·1	0	0·0
40–41	80	0·2	40	0·1
42–43	0	0·0	43	0·1
44–45	44	0·1	0	0·0
46–47	0	0	47	0·1

TABLE 3

Number of Play Participants in 'High' and 'Low' Schools Playing Structured Games. Percentage Out of Total Number Playing These Games in Each Type of School (N 'High' Schools=12,986; 'Low' Schools=8,438).

School Level	'High'		'Low'	
Group Size	Number of Players	% of Players	Number of Players	% of Players
2–3	3054	23·5	2808	33·3
4–5	3174	24·4	2223	26·4
6–7	2185	16·8	1355	16·1
8–9	1683	13·0	909	10·8
10–11	1125	8·7	557	6·6
12–13	665	5·1	243	2·9
14–15	345	2·7	201	2·4
16–17	347	2·7	64	0·8
18–19	166	1·3	36	0·4
20–21	81	0·6	20	0·2
22–23	68	0·5	22	0·3
24–25	25	0·1	0	0·0
30–31	30	0·2	0	0·0
38–39	38	0·3	0	0·0

play participants with age and that, more specifically, by far the most frequent group size is 2–3.

However, there is the following rather interesting finding which partly contradicts James's claim, or rather restricts its general validity. From Table 4, which expands part of the data contained in Table 2 and details group sized 2–3 and 4–5 for the top school grade, it may be seen that in 'high' schools, in this grade, the percentage of children playing in groups sized 4–5 is virtually identical to that of children playing in groups sized 2–3. As a matter of fact, the exact percentage for group size 2 is 10·9 while the percentage for group size 4 is 11·8, which is significantly greater (P<·01).

TABLE 4

NUMBER OF PLAY PARTICIPANTS IN 8TH GRADE OF 'HIGH' AND 'LOW' SCHOOLS PLAYING IN GROUPS SIZED 2–3 and 4–5. PERCENTAGE OUT OF TOTAL NUMBER OF 8TH GRADE PLAYERS IN EACH TYPE OF SCHOOL. (N 'HIGH' SCHOOLS=3,460; 'LOW' SCHOOLS=3,153)

School Level	'HIGH'		'LOW'	
Group Size	Number of Players	% of Players	Number of Players	% of Players
2–3	627	18·1	827	26·2
4–5	618	17·9	618	19·6

IV.—DISCUSSION.

The purpose of our investigation was to compare the relative size of play groups of children of different age and status groups. We have found, according to our hypothesis 1, that the proportion of players (aged 6 to 14) in small-sized groups decreases with age. Moreover, it turned out, as claimed by James (*op. cit.*), that two-member groups represent the most frequent grouping, with one exception to be discussed below.

Our second hypothesis, comparing 'high' and 'low' children, was also confirmed. It was shown that more 'low' than 'high' children play in the smaller-sized groups, whether all games or only those played by children of both status groups are included in the comparisons. These results indicate that with regard to the size of play groups, there appears to exist a gap in 'level of playing' between 'low' and 'high' children, just as it exists with regard to skills required in the formal school setting. Moreover, the well-known fact that 'low' children have a greater tendency for grouping into semi-permanent gangs apparently, then, has no positive effect on the ability of these children to play in large-sized groups, indicating that the competences involved go definitely beyond those expressed in ganging together.

When both age and socio-economic level are taken simultaneously into consideration, we may expect findings that will differ from those that take only one of these factors into account. Indeed, while James's claim, mentioned above, that two-member groups represent the most frequent grouping has been confirmed overall, we also find that 'high' children in the top school grade played significantly more often in four-member groups.

The size of play groups is, of course, not the only index for level of play. Let us mention, therefore, if only briefly, that other findings of ours, not to be reported here in detail, definitely indicate that with regard to another such index, which we shall call here briefly ' game span,' i.e., the duration of a single round of a game whose duration is not determined by the rules of the game, this span is significantly shorter for ' low ' than for ' high ' children, and for younger than for older children.

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THE ABILITIES OF PARTIALLY HEARING CHILDREN

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SUMMARY. 100 children aged 8 to 16, in a residential school for the partially hearing (48 boys, 52 girls) were tested on the performance and verbal subscales of the WISC and on tests of reading and arithmetic. Measures of hearing loss and social adjustment were obtained. Age, sex, parental social class and supposed aetiology were recorded for each child. Ratings of parental interest in the child's school progress and the amount of parental pre-school guidance received were also made.

The distribution of quotients on the WISC Performance subscale was found to be closely similar to that of the standardisation population. However, the distributions of quotients on the verbal subscale and the measures of attainment, though normal, were depressed by up to 21 points from the standardisation means. The social adjustment of the children was found to be significantly worse than that of a group of normal 7- and 8-year-olds, the predominant pattern of maladjustment being demonstrative rather than withdrawing. The first three factors obtained from a principal components analysis rotated to the Varimax criterion were identified as Verbal, Numerical and Performance Ability. These three factors were contrasted with the two found by analysing Wechsler's correlation data on the WISC.

I.—INTRODUCTION AND REVIEW OF THE LITERATURE.

THE first residential school for the partially hearing (or partially deaf as these children were then known) was opened in Great Britain over 20 years ago. However, only one limited study of this category of handicapped children has so far been reported in this country (Simpson Smith, 1962).

On the other hand, psychological and educational studies of the deaf (as opposed to the partially hearing) date back to the second decade of the present century. It was early established that the distribution of intelligence among children in schools for the deaf, both in the United States and in Great Britain, when measured by means of performance tests, was not significantly different from that of the population at large (MacKane, 1933; see also a review in Myklebust, 1964). School attainments, however, fell considerably below those of the normally hearing child and tended to lag even further behind as the child grew older. According to the early studies of Pintner and his pupils in the USA, using the Reamer Educational Scale, the 12-year-old deaf child scored on average less than the 8-year-old hearing child; even by the age of 15 the deaf child achieved only a mean score equivalent to that of the 9-year-old hearing child (Day, Fusfield and Pintner, 1928). This educational retardation was readily explicable in terms of restricted linguistic competence brought about by the sensory deprivation.

However, in the succeeding decades evidence began to accrue that deaf children also did less well than the normally hearing on certain tasks which were ostensibly non-verbal such as the Pintner Non-language Mental Test and (in more recent studies) the Raven's Matrices (Ewing and Stanton, 1942-43; Oleron, 1950) and certain Piagetian tasks (Oleron and Herren, 1961). The interpretation of these findings is difficult and Furth has recently suggested that they may in part be due to inadequacies in the experimental methodology, resulting in a failure of the subjects to understand what was required of them (Furth, 1966; see also Darbyshire and Reeves, 1969).

Other evidence relative to this point has come from the use of the Wechsler scales. Although deaf children are found to have a normal distribution of intelligence quotients as measured on the performance subscale, a subtest analysis reveals a typical profile in which Digit Symbol and Picture Arrangement subtests are relatively difficult and Object Assembly and Block Design relatively easy (L. J. Murphy, 1957; K. P. Murphy, 1957; Myklebust, 1964; Evans, 1966; Pickles, 1966).

Studies of the personality of the deaf suggest that they have difficulty in adjusting to their environment. They are somewhat more introverted and a little less dominant than unhandicapped people. They are more neurotic, more egocentric and have somewhat more feelings of depression and suspicion. They are less mature in judgment and social competence; the gap in social maturity between the deaf and the normally hearing child widens with increasing age. Deaf children have more fears than the normally hearing (Berlinsky, 1952; Myklebust, 1964). Two British studies of partially hearing children in normal schools, while agreeing that there is a high proportion of unsettledness and maladjustment among these children, disagree about the nature of the maladjustment. Johnson (1962) has claimed that the typical pattern is one of solitariness and withdrawal; while Fisher (1965), using the Bristol Social Adjustment Guide, has produced objective evidence of the predominance of a mixed pattern of demonstrative and withdrawing behaviour. A surprising finding in this area is that the incidence of maladjustment among partially hearing girls is not significantly smaller than that among partially hearing boys.

There is conflicting evidence regarding the relationship between degree of hearing loss and mental ability in the deaf. Montgomery (1968), for example, found no significant relationship between residual hearing and various verbal and non-verbal cognitive measures in a group of 66 profoundly deaf Scots children. Two earlier studies, however, found correlations between degree of hearing loss and scores on the Gates Reading Vocabulary Test (Gaskill, 1952; K. P. Murphy, 1956).

A feature of recent provision for the deaf has been the early ascertainment of the handicap, together with the early provision of hearing aids and a service of guidance and training for parents in the techniques of developing language in their child. In a recent study of two groups of partially hearing children whose parents had or had not received such guidance, Campbell (1967) showed that the experimental subjects had a better understanding of spoken language than the controls.

II.—AIMS AND METHODS.

The research reported here set out to measure the intelligence, attainments and social adjustment of all the 100 children aged 8 to 16 (of whom 52 were girls) at a school for the partially hearing. The children were individually tested on both subscales of the WISC while Schonell's Silent Reading Tests A and B (R3 and R4) and Essential Mechanical and Problem Arithmetic Tests were administered to groups of approximately 10 children at a time. All testing was undertaken by the writer who is a psychologist and experienced teacher of the deaf. Social adjustment was assessed by means of the Bristol Social Adjustment Guides, marked by the children's class teachers and scored by the writer. Mean hearing losses were calculated from audiograms made annually by the school's audiologist. The supposed aetiology of deafness was obtained from medical records while a rating of amount of pre-school parent guidance received by the child's parents was made by reference to educational records and other enquiries. Parental social class was recorded and a rating of parental interest in the child's school progress was made jointly by the principal and deputy head of the school who are in frequent contact with parents. Finally, age and sex were included as variables.

III.—THE NORMATIVE DATA—STATEMENT AND DISCUSSION.

The mean average hearing loss of the children was found to be 66·1 db and the median 63·3 db, the range being from 35 db to 108 db and the semi-interquartile range, 9·4 db.

For 27 per cent of the children the cause of deafness was unknown. 36 per cent were judged to have a pre-natal aetiology, 25 per cent a perinatal aetiology and 12 per cent a post-natal aetiology. By a different classification 25 per cent had acquired some form of genetically determined (endogenous) deafness, while as many as 37 per cent were judged to have suffered some form of brain damage leading to impaired hearing (exogenous deafness). This finding reflects the increased number of children being saved by improved medical care from perinatal death but at the cost of sensory and other damage.

The social class distribution was not significantly different from that for the area from which the children came.

The mean quotients for the intelligence and attainment variables together with their standard deviations are shown in Table 1. The findings are in line with those of studies of the deaf. The WISC performance quotients were normally distributed and their mean and standard deviation did not differ significantly from the norms. While the WISC verbal quotients were also normally distributed, the mean of 82·0 was very significantly lower than that of the performance subscale (difference=16·1 IQ points, $SE_M=1{\cdot}23$, 3.18 points being significant at the 1 per cent level). The average partially hearing child in this sample is thus functioning verbally at about the twelfth percentile of the population at large, although in the performance subscale he functions similarly to the unhandicapped child.

TABLE 1

MEANS AND STANDARD DEVIATIONS OF QUOTIENTS OBTAINED BY 100 PARTIALLY HEARING CHILDREN IN WISC AND THREE ATTAINMENT TESTS.

	Mean	s.d.
WISC Performance Subscale Quotients	98·1	12·77
WISC Verbal Subscale Quotients	82·0	12·52
Schonell Silent Reading	78·8	11·68
Schonell Mechanical Arithmetic	80·1	12·00
Schonell Problem Arithmetic	79·4	11·38

However, this account is somewhat simplified as an analysis of variance carried out on the scaled subtest scores shows. The between variance was significantly greater than the within, but the tests did not divide simply into verbal and performance as can be shown from Table 2.

A group of three performance subtests each had mean scaled scores close to 10 while four verbal subtests had means close to 7. The differences between these two groups were highly significant. The remaining three subtests, Object

TABLE 2

MEAN SCALED SCORES IN 10 WISC SUBTESTS.

Subtest	Mean Scaled Score
Block Design (P)	10·36
Coding (P)	10·25
Picture Completion (P)	10·12
Object Assembly (P)	9·21
Picture Arrangement (P)	8·61
Arithmetic (V)	8·16
Comprehension (V)	7·06
Vocabulary (V)	6·89
Information (V)	6·88
Similarities (V)	6·68

Assembly, Picture Arrangement and Arithmetic fell into an intermediate group and the difference between Picture Arrangement and Arithmetic was non-significant. The relative difficulty of Picture Arrangement among the performance subtests, it may be hypothesised, is a consequence of the way in which linguistic facility mediates in the solution of some of the items. This hypothesis is borne out by the fact that Picture Arrangement correlates most highly of the performance subtests with the verbal subscale as a whole (r= ·30), and with the Information (r= ·25) and Vocabulary (r= ·31) subtests in particular.

The intermediate position of the Arithmetic subtest may be attributed to the fact that some non-verbal skills are involved in the solution of the items in this subtest.

There was a significant sex difference on both the WISC subscales, the boys being superior by 6·10 points on the performance subscale and 4·54 points on the verbal subscale (t=2·467 and t=1·984, respectively). The interpretation of this finding is not easy and though there have been isolated reports of similar findings in favour of deaf boys in no previous case was the WISC employed. It is, therefore, felt that the finding may be a peculiarity of the sample.

There was evidence that children with greater hearing losses performed worse on the verbal subscale (r= –0·31). In view of this finding it was urged that verbal intelligence tests should not be used as measures of potential ability in partially hearing children without reference to hearing loss. It was argued, however, that such tests might be valuable in placing partially hearing children since a measure of level of verbal functioning is an important factor when selecting suitable educational provision (Watson, 1967).

The mean reading and arithmetic quotients obtained are shown in Table 1. All these variables correlated significantly with age (r=–0·38, r=–0·59 and r= –0·29, respectively) showing, in line with findings relating to the deaf, that attainments decline with increasing age. It is clear that not only are partially hearing children retarded relative to the normally hearing, but they also fall *proportionately* further behind as they grow older.

Forty-six children scored between 0 and 9 on the Bristol Social Adjustment Guides while 38 had scores between 10 and 19 (' unsettled ') and a further 20 had scores of 20 or above (' maladjusted '). This distribution was significantly different from that found by Crawford among normal 7 and 8-year-olds in Liverpool (Crawford, 1963 ; χ^2=21·531, df=2, P< ·01, N=104, including two children with adventitious deafness and two for whom other data were incomplete).

Fisher's technique (Fisher, 1965) of classifying children scoring 10 or more on the Bristol Social Adjustment Guide as demonstrative, withdrawing or of mixed type was employed. 38 (65 per cent) of the 58 children were classified as demonstrative and 10 each (17 per cent) as withdrawing or of mixed type. Contrary to some previous evidence, these partially hearing children tend predominantly to adopt a demonstrative mode of expression when maladjusted. This finding was even more marked ($X^2=10{\cdot}313$, df=2, $P<{\cdot}01$) than had been Fisher's relating to partially hearing children in normal schools. The present study supported Fisher's finding that maladjustment is no less common among partially hearing girls than among partially hearing boys.

IV.—THE FACTOR ANALYSIS.

A factor analysis of 24 variables was undertaken using the University of Manchester Department of Education's L2A programme. The printout from this gives a Principal Components analysis with a Varimax orthogonal rotation (Kaiser, 1958) and Promax oblique rotation Hendrikson and White, 1964), followed by higher order analyses.

Six principal components with roots greater than 1·00 were extracted, accounting for 68 per cent of the total variance. The first component accounted for 28 per cent of variance followed by two major group factors accounting for 13 and 10 per cent, respectively. Finally, three minor factors accounted for a further 6, 6 and 5 per cent, respectively.

On rotation to the Varimax criterion, with its orthogonal factors, the variance has been more evenly distributed (see Table 3), but there are still two clear groups of factors, numbers IV, V and VI together accounting for only slightly more variance than Factor I.

A further rotation to the Promax criterion resulted in some degree of obliquity between Factors I, II and III (intercorrelations of between 0·24 and 0·29), see Table 4, while Factors IV, V and VI remained orthogonal among themselves, each being slightly oblique to one of the first two factors.

V.—DISCUSSION OF THE FACTOR ANALYSIS.

The relative orthogonality of the Promax factors suggested that this oblique rotation added little to the simplification of the data so that the Varimax rotation has been chosen for interpretation.

Factor I has its highest loadings on the WISC verbal subscale, the WISC verbal subtests (with the exception of Arithmetic) and Reading. It is therefore named Verbal Ability and identified with Thurstone's V.

Factor II has its highest loadings on the two Schonell Arithmetic tests and WISC Arithmetic. There is also a smaller loading on WISC Coding. This factor is, therefore, identified as Numerical Ability (N).

Factor III is principally loaded on the WISC performance subscale and subtests and is, therefore, named Performance Ability.

Factor IV is a doublet loaded on Parental Social Class and a five-point rating for parental interest in the child's educational progress. This factor is identified as Home Background.

The last two factors, which contribute only small amounts of variance, appear to be specific to the present enquiry. Factor V has one high loading on male sex and one medium loading on exogenous aetiology, while Factor VI

TABLE 3

LOADINGS OF 24 VARIABLES ON SIX FACTORS ROTATED TO VARIMAX CRITERION.

Variables	Factors						
	I	II	III	IV	V	VI	h²
Reading	756	353	025	*031*	*043*	272	773
WISC Verbal Subscale	921	257	151	134	080	*092*	970
WISC Information	786	147	103	073	*004*	*077*	661
WISC Comprehension	744	*022*	132	115	227	*128*	652
WISC Similarities	749	020	179	107	*115*	*157*	643
WISC Vocabulary	881	096	076	052	143	122	829
WISC Coding	101	495	354	039	*311*	*029*	479
WISC Arithmetic	265	743	060	166	068	*095*	668
Schonell Mechanical Arithmetic	155	785	174	179	015	342	820
Schonell Problem Arithmetic	373	669	180	186	130	126	687
WISC Performance Subscale	195	243	930	080	028	032	970
WISC Picture Completion	207	*125*	592	*005*	353	*124*	549
WISC Picture Arrangement	281	*058*	679	*047*	*207*	023	589
WISC Block Design	037	375	736	137	121	120	731
WISC Object Assembly	071	131	775	100	107	106	656
Parental Social Class	*063*	*045*	*172*	*826*	023	*059*	722
Parental Interest	254	188	091	788	000	111	742
Male sex	108	011	276	*065*	712	*033*	600
Exogenous Aetiology	072	227	*170*	440	510	*111*	551
Average Hearing Loss	*367*	025	179	*025*	*102*	601	540
Age	077	*560*	092	*044*	*062*	*592*	685
Pre-school Guidance	*036*	165	012	396	*193*	703	717
BSAG score	003	*448*	*380*	087	366	051	489
Maladjustment type	355	*074*	*002*	*187*	332	541	569
Latent Roots	4.69	2.96	3.43	1.89	1.47	1.86	—
Percentage Variance	19.54	12.32	14.28	7.87	6.12	7.75	—

(Decimal points omitted, negative correlations in italics)

TABLE 4

INTERCORRELATIONS OF THE SIX FACTORS WHEN ROTATED TO THE PROMAX CRITERION.

	II	III	IV	V	VI
I	295	240	166	250	*008*
II		283	345	*021*	255
III			083	*088*	*003*
IV				092	024
V					023

(Decimal points omitted, negative correlations in italics.)

appears to result from a fortuitous association between the growth of pre-school parent guidance during the 1950's and a tendency for the school to accept deafer children with the progress of time.

Perhaps the most interesting finding here is that the intelligence and attainment variance divides into three factors. Previous factor analyses of the WISC on normal populations have revealed only two components (e.g., Maxwell, 1959).

It might be argued that the numerical factor found in this data results from the presence of the two arithmetic attainment variables. That this is not so, however, is shown when a separate analysis is performed on the WISC subtest data alone in which a numerical component loaded on Coding and Arithmetic is revealed accounting for 15 per cent of a total 65 per cent of variance. Moreover, a similar analysis of Wechsler's three correlation matrices (Wechsler, 1949) reveal in each case only two components (Hine, 1969). It seems then that the three abilities identified here tend to develop relatively more independently in partially hearing children than in unhandicapped children. This finding is further illustrated by the fact that the Promax rotations of the first three factors in the present data are relatively orthogonal ($r=0{\cdot}24$ to $r=0{\cdot}29$) while those between the verbal and performance components of Wechsler's data are relatively oblique (ranging from $r=0{\cdot}49$ to $r=0{\cdot}57$).

The factor structure, that is, the correlation of the variables with the various factors, is not discussed in detail here. It is hoped to expand on this aspect of the analysis elsewhere.

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THE O GRADE OF THE SCOTTISH CERTIFICATE OF EDUCATION

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Summary. The O grade of the Scottish Certificate of Education was introduced in 1962 as a certificate appropriate for those in the top 30 per cent of the age-group who had completed at least four years of secondary education. The number of subject presentations has risen from about 177,000 to over 246,000 in the first seven years—and it has been observed that pupils of under-average ability have been among the successful candidates. This has raised questions (*a*) on the relation between the ability measured by a verbal reasoning quotient and success in O grade examinations, and (*b*) on the standard of the examinations. The article contains a brief review of the history of certificates of this type in Scotland, a theoretical and practical study of the VRQ as predictor of success and of the relation between standard of examination and likelihood of success by under-average pupils, and an account of the performance of some of these pupils. The results show that the VRQ is a moderately good predictor of success; that successes by under-average pupils are compatible with this: but that recent interpretations of ' a reasonable prospect of success ' will, if accepted, require major alterations in pass-marks.

1.—Brief historical review.

A Departmental Committee of Inquiry, set up in 1886 under the chairmanship of C. S. Parker, M.P., to inquire into " certain questions relating to education in Scotland " recommended in their third report, which was a comprehensive review of secondary education, the creation of a national certificate examination to give secondary schools more definiteness of aim. In 1888 the Leaving Certificate examinations, conducted by the Scottish Education Department, were instituted, passes being awarded in individual subjects at three levels—lower, higher and honours grade. Examinations were set in six subjects: English (including History and Geography), Mathematics (including Arithmetic), Latin, Greek, French and German. Prescribed books were not introduced into the examination system.

The standard of the examination at the lower grade was to be comparable with the existing junior local examination or with the medical preliminary examinations. Encouragement to present pupils for the higher examination was given to the schools by the award of a lower grade pass for those who had narrowly failed the higher grade examination in a particular subject. This was regarded as a temporary measure until the standard of the three examinations had become known in the schools, and the system of compensatory passes was abandoned in 1892.

Originally certificates were granted for individual subjects and could be undertaken by pupils at any stage and in any order. In 1902, largely owing to pressure from professional bodies, the certificate became a group certificate and passes in individual subjects were discontinued. The group certificate was awarded to candidates who gained either four passes on the higher or honours grade or three on the higher grade and two on the lower grade. Passes in English on the higher grade and Mathematics on at least lower grade were pre-requisite for the award of the certificate. Another condition was that where the candidate was presented in two languages other than English, higher or lower Latin was necessary.

Innovations such as the Leaving Certificate Examinations were subject to criticism in certain educational circles ; the universities, for example, refused to recognise the certificate in its first year. No details of percentage passes in the various grades were published. In its first year, the certificate examinations were given in 29 schools, and 972 candidates sat 4,300 subject examinations giving an average of nearly five subjects for each candidate. Some estimate of the tremendous expansion of educational facilities can be gathered by comparison with present-day figures : in 1968 at 567 centres 87,081 candidates were presented for O and H grade subjects, giving rise altogether to 345,531 subject presentations.

In 1908, the honours grade was discontinued and the requirement that all courses leading to the certificate be approved by the Department was introduced, thus making the certificate an official recognition of a satisfactory course of study successfully completed. Two very important new features were introduced into the award of the certificate. First, pupils who had excelled in one subject and narrowly failed in another were given the certificate in view of the outstanding performance : this type of compensatory award was a novel feature of the award of the group certificate. Secondly, teachers' assessments were taken into account in deciding a pass or fail. This was a very important development, because it took into account the work which the pupil had done throughout the year, and this avoided the hit and miss nature of awarding a pass on a single examination.

In 1902 an Intermediate Certificate was introduced for those pupils who could not remain at school to complete a full course of secondary education. Two years attendance at a secondary school was a condition of entry to the examinations. To gain a certificate, a candidate had to pass in four subjects, one of which had to be on a higher grade : the compulsory subjects were English and Latin. This certificate was discontinued in 1924.

The Advisory Council on Education in Scotland in their report on secondary education which was published in 1947 made several recommendations about the award of national certificates. There should be no certificate for pupils at 15 years, based on an external test ; the Council considered that the introduction of an external examination would have 'a calamitous effect' on the increasing numbers who were receiving secondary education due to the raising of the compulsory school leaving age. They recommended, however, that a school certificate should be awarded at 16 years. This standard, however, had not to be pitched so high that pupils of average ability would reach it only by a docile surrender of the whole evening to book studies. This certificate was to be a subject certificate, but a condition of entry was that pupils should be presented in a group of subjects. The Secretary of State accepted the advice of the Advisory Council on the question of certificates for individual subjects and the change was made in 1950.

In 1957 the Secretary of State for Scotland set up a Working Party on the Curriculum of the Senior Secondary School with the remit : " To consider how senior secondary courses should be organised so that the varying educational needs of the pupils who embark on these courses can be adequately met and to make recommendations as to the general conditions which should in consequence govern the award of the Scottish Leaving Certificate on both the new Ordinary grade and the existing Higher grade." One of the most fundamental changes in the leaving certificate examinations followed the recommendations in the report. As the certificate was to mark a stage in the pupil's educational career it was suggested that the name of the certificate should be changed to Scottish Certificate of Education. Candidates were to be eligible for presentation on either Ordinary or Higher grade in any examination subject and there were to be no compulsory presentations in any particular subject. Furthermore, candidates were to be awarded a certificate if they obtained even a single pass on either grade and pupils returning to school could retain the certificate already gained.

Another feature of the new certificate as recommended by the Working Party was what must be regarded as a first attempt to define the standard of the O grade of the certificate—" the standard should be such that a pupil who is at the lower end of the top 30 per cent of any age group, with satisfactory teaching and adequate effort on his part, would have a reasonable prospect of securing passes at the Ordinary grade in at least three subjects in the fourth year." The relationship between O and H grades of the examination was not clearly defined, although it was acknowledged that the O grade would be of a lower standard than the Lower grade which it was to replace. Pupils proceeding to the H grade in the fifth year of school should have progressed in the fourth year well beyond the standard of the O grade. Whether pupils were to bypass the O grade examination was not made clear, although the working party recommended that a candidate who failed on the Higher grade should be considered for the award of a compensatory pass on the O grade.

The O grade examinations were introduced in 1962 and have proved to be popular with schools and further education colleges alike : presentations have mounted rapidly. Admission to many careers now depends on the applicant holding a Scottish Certificate of Education with specific O grade passes and universities have accepted the O grade as a substitute for the lower grade of the Scottish Leaving Certificate.

This short history of what has become the Scottish Certificate of Education underlines three issues.

First, the view whether the certificate should be a subject or group certificate has been subject to change. The broadening character of secondary education makes it now very difficult to organise a group certificate.

Secondly, the increasing numbers taking advantage of secondary education has made it necessary for the certificate to be within reach of a wider range of ability.

Thirdly, educationists feel strongly that the pupils' work throughout their schooling should be taken into account. The ' compensatory pass ' and the use of teachers' estimates are both acknowledgments that an external examination should not be the sole instrument used to assess pupils' attainments.

2.—INCREASE IN PRESENTATIONS.

The number of presentations for the O grade of the Scottish Certificate of Education has been increasing steadily since its inception in 1962. Table 2.1 shows the presentations for the Lower Certificate in 1960 and 1961 and the O grade presentations from 1962 to 1968.

TABLE 2.1

NUMBER OF LOWER AND O GRADE PRESENTATIONS : 1960–1968.

Year	No. of subjects	No. of Presentations at Lower/Ordinary Grade	No. of candidates per number of subjects								
			1	2	3	4	5	6	7	8	9
1960 Lower	20	46,672	3823	4035	3667	2140	714	5 or over			
1961 Lower	20	50,153	4068	4178	3901	2397	800				
1962 Ordinary	37*	176,724	4369	4580	4804	5406	5315	6088	5099	2437	927
1963	37	181,989	10260	6552	5425	4282	4501	5192	5360	3088	1021
1964	37	194,162	12824	8122	6457	4949	4667	5419	5445	3155	961
1965	39*	199,167	14987	8866	5905	4547	4599	5551	5629	3351	861
1966	39	210,255	17423	9152	5835	4605	4857	5881	6057	3697	967
1967	39	225,089	18819	9769	5833	4706	5050	6318	6612	4019	975
1968	42*	246,339	20964	10388	5851	4922	5468	6916	7430	4590	1078

* New subjects at O Grade.
1962 : Modern Studies, Applied Maths., Horticulture, Navigation.
1965 : Portuguese, Anatomy, Physiology and Health.
1968 : Statistics, Norwegian, Swedish.

Increase in number of subjects.

The increase in the number of presentations in 1962 as compared with those for the lower grade in 1961 is in part due to the sub-division of subjects. When the Ordinary grade was introduced the following changes were made in the existing subjects.

Lower Grade	*Ordinary Grade*
Gaelic	Gaelic Native Speakers, Gaelic Learners.
Science	Physics, Chemistry, Botany, Zoology, Biology.
Technical Subjects ..	Applied Mechanics, Technical Drawing, Woodwork, Metalwork.
Homecraft	Home Management, Dress and Design.
Commercial Subjects	Economic Organisation, Principles of Accounts, Shorthand and Typewriting.

As can be seen from the above, five subjects have been split into 16, thus giving pupils a much wider choice. Prior to 1962 pupils were presented for science, but thereafter they could be presented in two or more branches of the subject, thus increasing the number of presentations.

By this system, the certificate without reference to endorsements has lost much of its significance: the possession of a Scottish Certificate of Education could indicate having passed one subject on the O grade or six subjects on the higher grade. The importance of the certificate is signified by the endorsements : professional bodies now list the number, grade and subjects required as an admission qualification.

The range of subjects has also increased by the introduction of new subjects as shown at the foot of Table 2.1. Candidates for the certificate in 1968 had a choice of 42 subjects at O grade and there are regular appeals for the recognition of other subjects.

Increase in number of candidates

The very large increase in presentations is also in part due to the greater educational facilities available to all pupils. After 1962, many junior secondary schools recognised that at least some of their pupils were capable of attaining a certificate in one or more subjects. The number of pupils remaining at school beyond the statutory school leaving age steadily increased. The number of presenting schools rose from 334 in 1962 to 426 in 1968. This may be due in part to the new regulations which allowed candidates to be presented for any number of subjects over any number of years.

A new feature of the presentations also was the number of students at further education centres who took courses leading to the award of the certificate. This was partly due to the increasing recognition given to the Scottish Certificate of Education for career purposes. Not only did the local technical colleges present students taking further education courses but they were also asked by education authorities to accommodate external candidates. The number of presenting further education centres in 1968 was 138.

The nature of the certificate must also help to explain the large number of presentations: for example, a large number of candidates were presented for a single subject, and the very large choice of subjects is another possible reason for the increase in numbers. The abandonment of the idea that pupils should have compulsory subjects in a course would lead, in some cases, to pupils who had a special skill in particular subjects, such as art or music, being persuaded to remain at school and be given an opportunity to gain a certificate in the subject in which they had an obvious skill.

Lowering of standards.

The increase in the number of pupils gaining a certificate has led to the suggestion that the standard of the O grade pass was lower than that which was adopted for the lower grade of the Leaving Certificate. Schools, naturally, were presenting pupils of much lower ability than formerly were considered capable of gaining a certificate. The fact that pupils below the bottom of the top 30 per cent were successfully presented for the certificate has also been thought to lend weight to the view that the standard of the pass mark was beneath that suggested by the Working Party.

Purpose of the investigation.

This investigation attempts, in the first place, to give a simple statement of the theoretical basis of the pass/fail type of examination. A comparison between the proportion of pupils who theoretically could pass the examination and the actual number of successful presentations makes it possible to give some estimate of the standard of the O grade. Secondly, it gives an account of a limited investigation into the achievement of below-average pupils who were presented for the SCE O grade examinations.

The investigation was planned to study the attainments of fourth-year pupils who sat the O grade examinations in 1966, and to obtain information about pupils of ' below average ' ability who obtained at least one pass. ' Below average ' as a description of the pupils was a working rather than a precise definition. It included any pupil who had at least one VRQ below 100 at the transfer stage (age 12 years in Scotland). Moray House verbal reasoning tests were used when the pupils in the investigation were in the primary schools. Some areas used norms calculated on the scores of an age group in that area with a mean verbal reasoning quotient set at 100. Others used published national norms calculated on a large sample of pupils from all over Britain. In one area using the national norms the mean VRQ over five years was 103 points, so the term 'below average' does not represent precisely the same standard for each area.

3.—PRELIMINARY FINDINGS AND THEORETICAL CONSIDERATIONS.

Preliminary findings.

The committee set up by the Scottish Council for Research in Education to supervise the investigation decided to enlist the aid of local research groups to obtain the necessary data and to conduct preliminary analyses. The response from the selected areas was different in each area. In Dundee the College of Education formed a group which collected and analysed a great deal of material from schools in Dundee, Angus, Clackmannan, Perth and Kinross. The College of Education in Aberdeen undertook a similar task for the schools of the city. In Edinburgh the education authority collected the data and the preliminary analysis was undertaken by a group of headmasters. In Glasgow a sample of schools was used and the data forwarded to the Research Council. The counties of East Lothian, Fife and Selkirk also provided data and the Council was given access to information collected by the educational psychologist for Caithness for a separate investigation.

Data collected in such diverse ways do not always fit neatly into a pattern for analysis but the following tables give some idea of the picture presented. In accordance with the usual practice of the Council, the identity of each area is concealed by the use of a code.

TABLE 3.1

4TH YEAR O GRADE PASSES BY AREA.

Area	Numbers of pupils successful in				Percentages	
	one or more subjects		three or more subjects			
	(1) with VRQ below 100	(2) of any VRQ	(3) with VRQ below 100	(4) of any VRQ	Col 1/Col 2	Col 3/Col 4
A	28	226	NK	NK	12·4	NK
B	19	154	12	138	12·3	8·7
C	283	2148	134	1719	13·1	7·8
D	12	261	3	210	4·6	1·4
E	102	1858	NK	NK	6·2	NK
F	65	1396	39	1213	4·6	3·2
G	53	620	NK	NK	8·6	NK
H	16	150	NK	NK	10·7	NK
Totals	578	6813	188	3280	8·5	5·7

NK—not known.

On the evidence obtained from these areas it would appear that over 8 per cent of the pupils gaining at least one pass in the certificate in their fourth year were of under-average intelligence as measured by the verbal reasoning quotient obtained four or five years previously, and about 6 per cent of those gaining a certificate with at least three passes were in the same category. The questions that have been raised are : (*a*) Do these figures show that VRQs are poor predictors of success in the O grade examinations ? (*b*) Do they show that the standard set by examiners for the certificate is low ? It is hoped that the following analysis will convince the reader that the answers to both questions are in the negative. Before tackling the analysis we must define our terms.

Definition of terms.

When the scheme for the issue of O grade certificates was launched in 1959, it was stated that the standard was to be such that all pupils in the top 30 per cent of an age group would have " a reasonable prospect of securing passes in at least three subjects in the fourth year of the secondary course " (Scottish Education Department, 1959a).

This was a rewording of the recommendation by the Working Party Report accepted by the Secretary of State which had stated " The standard of the O grade examination should be such that a pupil at the lower end of the top 30 per cent of any age group should, with satisfactory teaching and adequate effort on his part, have a reasonable prospect of securing passes in at least three subjects in the fourth year " (Scottish Education Department, 1959b).

The terms ' top 30 per cent ' and ' lower end ' refer to some distribution not specified in the Circular but appear from the Report (Section 11) to refer to the assessments of ability and attainment which were previously provided at the stage of transfer from primary to secondary education. These are no longer so widely used but the verbal reasoning quotient is still available in the case of many pupils and will serve as a convenient measure of ability for the present discussion. The average VRQ for an age group is 100 and the pupil at the lower end of the top 30 per cent of the age group has a VRQ in the region of 108.

' Reasonable prospect ' also requires closer definition ; in the first set of calculations this will be interpreted as a fifty-fifty chance, but in a later set an alternative interpretation will be examined.

Having thus defined our terms we consider first the relation between VRQ and success in the O grade examinations.

The VRQ as predictor of O grade success—some theoretical considerations.

If the VRQ were a perfect predictor of success in the O grade examination and if 30 per cent of an age group obtained passes in at least three subjects we should have Table 3.2, in which 100 pupils are considered. The situation is shown diagrammatically in Figure 3.1.

In the real situation, as everyone knows, the correlation is not perfect. The correlation coefficient, which measures the amount of agreement between the predictor and the criterion (VRQ and O grade success), has been found in several investigations to be around 0·8. This represents moderately good agreement on a scale on which zero represents no relation whatever and 1 represents perfect agreement.

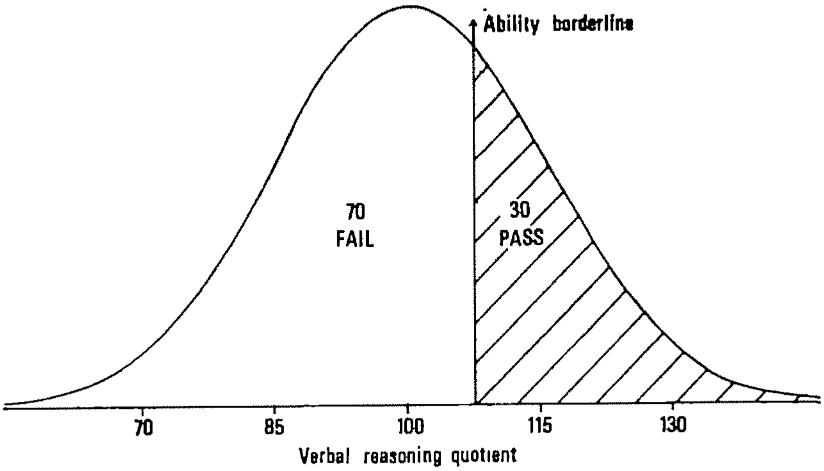

FIG. 3.1 Pass-fail distribution for perfect correlation

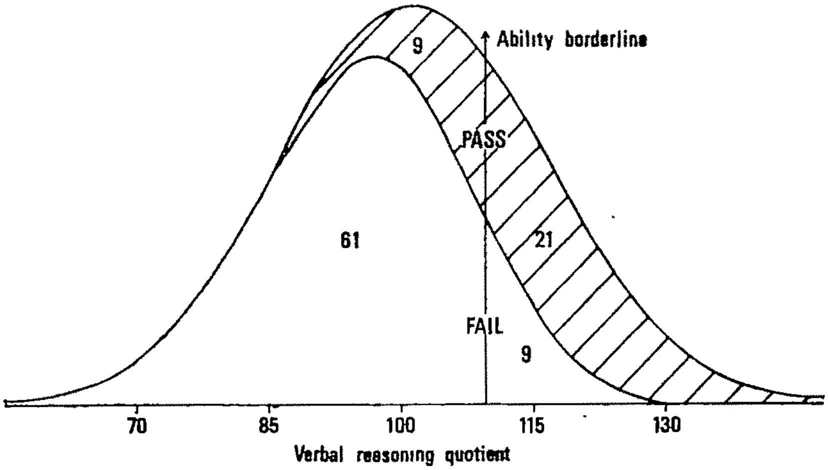

FIG. 3.2 Pass-fail distribution for correlation 0.8

TABLE 3.2

RELATION BETWEEN ABILITY AND ATTAINMENT FOR PERFECT CORRELATION.

O grade attainment	Ability as measured by VRQ		Totals
	Lower 70%	Upper 30%	
Pass	—	30	30
Fail................	70	—	70
Totals..............	70	30	100

If we assume that ability and the attainment of an O grade pass are variables distributed normally (in the statistician's sense) and correlated to the extent 0·8, the figures in Table 3.2 change to the figures of Table 3.3 in which the pass mark is fixed so that 30 per cent succeed. The reader who wishes to examine the source of these figures will find it in Pearson (1931), Part II, Table VIII. The situation is shown diagrammatically in Figure 3·2. A fuller explanation of the use of this diagram is given in McIntosh (1959, p. 156).

TABLE 3.3

Relation Between Ability and Attainment When Correlation is 0·8

O grade attainment	Ability as measured by VRQ		Totals
	Lower 70%	Upper 30%	
Pass	9	21	30
Fail	61	9	70
Totals	70	30	100

We now find that the 30 passes have been obtained by nine pupils from the lower group of ability and 21 from the higher group, i.e., with a correlation of 0·8 we expect a proportion of nine-thirtieths of the successful candidates to come from lower levels of ability.

If the correlation is as high as 0·9, and this is a high level to find between tests separated by four or five years, we obtain the figures of Table 3.4. Even with a correlation as high as 0·9, one-fifth of the successes come from the lower ability group.

TABLE 3.4

Relation Between Ability and Attainment When r=0·9.

O grade attainment	Ability as measured by VRQ		Totals
	Lower 70%	Upper 30%	
Pass	6	24	30
Fail	64	6	70
Totals	70	30	100

As has been indicated, the investigation was concerned with pupils of under-average ability, defined as those with VRQs below 100 since the average VRQ in an age group is 100. The classification by ability in which we are interested is, therefore, into two equal groups, each with 50 per cent of the age group, and Tables 3.3 and 3.4 become Tables 3.5 and 3.6. The pass mark is retained at the former level, giving the pupil at the bottom of the top 30 per cent a fifty-fifty chance of success.

TABLE 3·5

RELATION BETWEEN ABILITY AND ATTAINMENT WHEN CORRELATION IS 0·8 AND DEMARCATION IS AT VRQ 100.

O grade attainment	Ability as measured by VRQ		Totals
	Below average	Above average	
Pass	3	27	30
Fail	47	23	70
Totals	50	50	100

TABLE 3.6

RELATION BETWEEN ABILITY AND ATTAINMENT WHEN CORRELATION IS 0·9 AND DEMARCATION IS AT VRQ 100.

O grade attainment	Ability as measured by VRQ		Totals
	Below average	Above average	
Pass	1	29	30
Fail	49	21	70
Totals	50	50	100

Even with a correlation as high as 0·9 and a demarcation at VRQ 100, we can expect one in 30 of the passes to come from the pupils of lower ability.

The reader should note that nothing has been said in the foregoing analysis about selection procedure. The assumption has been made that all pupils of whatever calibre have had the opportunity to attempt the examinations. If they were debarred from the attempt, the entry in the 'below average and pass' box would be zero and the assumption of linear correlation would not be valid.

We turn now from theory to examine the data obtained; to what extent do they fit into the theoretical framework and, if they do, what relation do they show between VRQ and O grade success?

The VRQ as predictor of O grade success—another look at the data.

The reader will have observed that Tables 3.2 to 3.6 use more information than was shown in Table 3.1. We require, in particular, the number of failures in each of the two bands of ability. In the tables which follow, this number has been obtained by subtracting the number of successes from the number in the age group, i.e., those in the age group who did not obtain a pass have been deemed to be failures. This is obviously a false assumption in a school which encourages the better pupils to bypass the O grade examination on the way to the Higher grade examinations but the effect of that procedure will be to decrease rather than increase any correlation that is found between VRQ and success.

Some areas were not able to supply all of the additional information required but the numbers and percentages for area C are shown in Table 3.7. In this table 'success' refers to passes in three or more subjects.

TABLE 3.7

RELATION BETWEEN ABILITY AND ATTAINMENT: NUMBERS AND PERCENTAGES OF PUPILS IN AREA C PASSING IN THREE OR MORE SUBJECTS.

O grade attainment	Ability as measured by VRQ				Totals	
	Below average		Above average			
Success	134	(1·9)	1585	(22·9)	1719	(24·8)
Failure	3326	(48·1)	1876	(27·1)	5202	(75·2)
Totals	3460	(50)	3461	(50)	6921	(100)

It can readily be shown from the table in Pearson (1931) referred to on page 187, that the numbers in Table 3.7 correspond to a correlation of approximately 0·8 between VRQ and success in obtaining three or more O grade passes.

If we redefine 'success' to be the obtaining of passes in *one* or more subjects we obtain for area C the numbers and percentages shown in Table 3.8. The correlation underlying this table is 0·76.

TABLE 3.8

RELATION BETWEEN ABILITY AND ATTAINMENT: AREA C—NUMBERS AND PERCENTAGES PASSING IN ONE OR MORE SUBJECTS.

O grade attainment	Ability as measured by VRQ				Totals	
	Below average		Above average			
Success	283	(4·1)	1865	(26·9)	2148	(31·0)
Failure	3177	(45·9)	1596	(23·1)	4773	(69·0)
Totals	3460	(50)	3461	(50)	6921	(100)

Similar tables were produced and correlations calculated for the remaining areas in which the necessary information was available. The results are shown in summary form in Table 3.9.

There is a large measure of agreement among the correlation coefficients; they indicate that the VRQ is a good predictor of success in the SCE examinations when the whole range of quotients is taken into account. An answer to the first question raised by the data has, therefore, been provided.

It may be noted here that the entries in the category 'Below average/success' give some indication of the flexibility of the system of allocation of pupils to certificate and non-certificate courses, which prevailed in the early 1960s and was frequently criticised as being rigid. If the classification had been completely rigid and permanent, there would have been no entries in Table 3.9 where we have the numbers 19, 283, 12, 102, 65, 16 and 12, 134, 3 and 39. To the extent shown by these numbers, pupils classed as under average at the transfer stage had been given the opportunity to attempt the O grade examinations. The proportions are small and it will be interesting and important to ascertain whether they increase with the abandonment of the system of classification in the later 1960s.

TABLE 3.9

RELATION BETWEEN ABILITY AND ATTAINMENT: SIX AREAS AND BOTH LEVELS.

		Passes obtained in					
		one subject or more Ability			three subjects or more Ability		
Area	Attainment	Below average	Above average		Below average	Above average	
B	Success ..	19	135	r=0·82	12	126	r=0·85
	Failure ..	182	76		189	85	
C	Success ...	283	1865	0·76	134	1585	0·80
	Failure ..	3177	1596		3326	1876	
D	Success ..	12	249	0·90	3	207	0·95
	Failure ..	397	161		406	203	
E	Success ..	102	1756	0·87	Not available		
	Failure ..	2951	1297				
F	Success ..	65	1331	0·84	39	1174	0·87
	Failure ..	2765	1500		2791	1657	
H	Success ..	16	134	0·90	Not available		
	Failure ..	149	32				
Total successes ..		497	5470		188	3092	

Examination standards.

The second question arising from the data was concerned with standards; does the success gained by under-average pupils indicate that the standards set by examiners for the certificate are low?

The data of Table 3.9 can be presented in another form in Table 3.10 to show the percentage of the age group in each area obtaining passes (*a*) in one subject or more and (*b*) in three subjects or more. The figures for Scotland have been calculated from data provided in the *Report for* 1966 *of the Scottish Certificate of Education Examination Board* (Scottish Education Department, 1967a) and from figures for the age group given in *Scottish Educational Statistics*, 1966 (ibid., 1967b).

TABLE 3.10

PERCENTAGES OF AGE GROUP SUCCESSFUL IN O GRADE EXAMINATIONS.

	Percentage passing in	
Area	one or more subjects	three or more subjects
B	34·6	33·5
C	31·0	24·8
D	31·9	25·6
E	30·4	Not available
F	24·7	21·4
H	45·3	Not available
Scotland ..	32	25

The figures in Table 3.10 show the position in 1966. The percentage of the age group passing in three or more subjects in the fourth year rose in 1967 to 28 per cent and in 1968 to 31 per cent. These figures are in general agreement with the wishes of the Working Party and of the Department's Circular 412 referred to on page 185. The conclusion is that the standards set by the examiners have not been debased; although pupils with VRQs below 100 have gained certificates, the certificate with at least three passes at O grade level has been gained by only about 30 per cent of the age group normally enrolled in the fourth year of the secondary course.

What is ' a reasonable prospect ' of success ?

The Working Party Report included the recommendation that the pupil at the lower end of the top 30 per cent of any age group should, with satisfactory teaching and adequate effort on his part, have a reasonable prospect of securing passes in at least three subjects in the fourth year.

In the preceding analysis the term ' a reasonable prospect ' has been interpreted to mean a fifty-fifty chance, but this concept requires further examination. For a given correlation between VRQ and O grade success and a given proportion of successes in the age group it is possible to estimate the success-ratio or chance of success at any level of VRQ. Alternatively, given the correlation and the success-ratio at a given VRQ level it is possible to estimate the success-ratios at other levels and the proportion of the age group which will pass the examination. The method of calculating success-ratios is described in Walker (1957).

Table 3.11 is built on the average correlation of 0·85 obtained from Table 3.9 and a success-ratio of 50 per cent at VRQ 108, which is at the bottom of the top 30 per cent of the VRQ distribution. Success is defined as the possession of three O grade passes.

TABLE 3.11

SUCCESS-RATIOS FOR VARIOUS LEVELS OF VRQ.

VRQ	Success ratio
127	98%
122	93
117	84
113	69
108	50
103	31
99	16
94	7
89	2

The figures on this table indicate that a pupil with a VRQ of 127, selected at random from the age group of the fourth year of the secondary course, had a 98 per cent chance of success. A pupil with VRQ of 89, selected at random from the same age group, had only one chance in 50 of being successful. The few candidates with VRQs at that level who were successful were those who accepted the challenge of this low probability and became members of the 2 per cent.

On the basis of the figures of Table 3.11 it can be shown that the proportion of the age group obtaining the certificate would be 33 per cent. This agrees fairly closely with the position in 1968, when the percentage was 31 per cent.

But what changes have to be made if ' a reasonable prospect ' is interpreted in a different way? In an experiment in England and Wales in 1965, the Schools Council (1966) found that a group of examination boards interpreted the phrase ' may reasonably expect to succeed ' to mean that this would happen in five cases out of six. If ' a reasonable prospect ' is to be interpreted in that way, the figures in Table 3.11 require amendment. In Table 3.12 there are shown the success-ratios at various levels of VRQ for a correlation 0·85 between VRQ and success, with the pupil at the lower end of the top 30 per cent of the O grade ability range in the age group having an 84 per cent (i.e., about 5 in 6) chance of success, defined as passes in three or more subjects.

TABLE 3.12

SUCCESS-RATIOS FOR VARIOUS LEVELS OF VRQ WITH 84 PER CENT CHANCE AT THE BORDERLINE.

VRQ	Success-ratio
118	98%
113	93
108	84
104	69
99	50
94	31
90	16
85	7
81	2

It will be observed that the fifty-fifty chance now occurs at VRQ 99. A corollary is that 53 per cent of the age group would be above the pass mark. The new situation is shown in Figure 3.3.

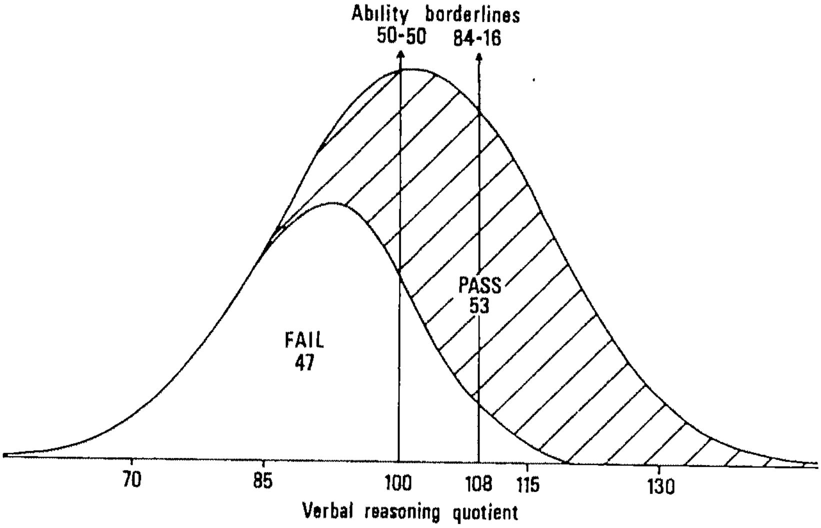

FIG. 3.3 Pass-fail distribution for correlation 0.85 with 84 per cent success at VRQ 108

It may be argued that the two situations in which the same phrase ' a reasonable prospect ' was used were different, in that the Scottish Working Party was referring to the pupil at the lower end of the top 30 per cent *of an age group*, while the examination boards in England were discussing pupils who were industrious and appropriately entered. This has certainly a bearing on the argument but carries less and less weight as the percentage of an age group presented for the certificates in the fourth year rises (it was 40 per cent in 1968) and as the date for the raising of the minimum school leaving age to 16 draws nearer.

Summary of Section 3.

To sum up ; the present standards of the O grade certificate examination in which about 30 per cent of an age group obtain passes in at least three subjects, are consistent with the attainment of some success by some pupils who are under average in ability. The fifty-fifty chance of success occurs at a VRQ level of about 108 ; those with VRQs below 100 have less than one chance in six of passing in at least three subjects, but some meet the challenge successfully.

These statements refer to the situation in which the correlation between success in the O grade and VRQ is high and in which ' a reasonable prospect of success ' is interpreted to mean a fifty-fifty chance. If the interpretation is to be more liberal, e.g., a reasonable prospect is to mean five chances of success in six for the pupil at the lower end of the top 30 per cent, these standards cannot be maintained, and the O grade certificate with passes in at least three subjects will be open to half of the age group.

4.—THE O GRADE PERFORMANCE OF THE UNDER-AVERAGE PUPIL.

Introduction.

Some of the local research groups which collected the data also provided analyses on lines which were of interest to them. Where possible the data provided were combined and the present chapter contains a selection of the tables so obtained. The conclusions drawn from these tables apply to the combined data. In most cases the total number of pupils included in these tables does not correspond exactly to the 497 obtained by totalling the separate numbers of Table 3.9 ; this occurred because some of the groups did not provide the details required to construct one or other of the new set of tables.

' Under-average ' was defined in Section 3 as " having a verbal reasoning quotient below 100." In the present section these pupils are referred to as members of the sample studied.

Presentations and passes.

Table 4.1 gives the average number of subjects for which pupils in the sample were presented at the O grade examinations in 1966 and also the average number of passes obtained. For purposes of comparison the corresponding figures are given for all fourth-year candidates, for those in four-year schools and those in five or six-year schools. These figures are extracted from the *Report for* 1966 of the Scottish Certificate of Education Examination Board. It should be noted that the numbers for the sample pupils arise from the current inquiry, whereas the numbers for the other categories refer to the whole of Scotland.

TABLE 4.1

PRESENTATIONS AND PASSES.

Source	Average number of presentations	Average number of passes	N
Sample pupils	4·4	2·6	467
Four-year schools..........	5·2	3·6	3898
Five-and six-year schools ..	5·8	4·5	23044
All 4th year pupils	5·7	4·4	26942

The numbers in the table speak for themselves. The sample pupils were presented in smaller groups of subjects and passed in fewer.

Relation between VRQ and number of subjects passed or failed.

Most of the research groups provided data showing the relation between VRQ and number of O grade passes for those whose VRQs were under 100. The combined figures are shown in Table 4.2.

TABLE 4.2

NUMBERS OF O GRADE PASSES AT EACH LEVEL OF VRQ.

VRQ	Number of O grade passes 0	1	2	3	4	5	6	7 or more	Total	Mean no of passes
95–99	28	79	73	54	42	28	25	14	343	2·75
90–94	12	28	26	11	14	5	3	3	102	2·18
85–89	10	9	3	5	1	1	1	2	32	1·84
80–84	2	1							3	0·33
below 80		1							1	1·00
Totals....	52	118	102	70	57	34	29	19	481	2·56

There is an obvious relation between VRQ and number of passes obtained. It will be observed that over 90 per cent of these successful candidates had VRQs over 90.

The reports from some of the areas recorded not only the passes but the failures of those with VRQs below 100 who were presented. The combined data are shown in Table 4.3.

TABLE 4.3

NUMBERS OF O GRADE SUCCESSES AND FAILURES AT EACH LEVEL OF VRQ.

IQ	Number of Passes 0	1	2	3	4	5	6	7	Total	Mean	Number of Failures 0	1	2	3	4	5	6	Total	Mean
95–99	8	47	28	25	17	13	11	6	155	2·7	21	32	46	31	21	3	1	155	2·0
90–94	12	12	7	4	3	3		1	42	1·7	4	10	8	14	3	3		42	2·3
85–89	1	5	2		1		1	1	11	2·4	2	3	4		2			11	1·7
80–84	2	1							3	0·3	1			2				3	2·0
below 80																			
Totals	23	65	37	29	21	16	12	8	211		28	45	58	47	26	6	1	211	

Of the 28 candidates who had no failures eight were presented in only one subject; of the 23 who had no success four were presented in only one subject.

Subjects chosen by the under-average pupil.

The subjects in which these pupils were presented for the O grade examinations covered a wide range. It is not surprising to find that the classics are poorly represented. There were, in fact, three pupils in the group who were presented in Latin but all failed. Neither is it surprising that the greatest number of passes was in English and arithmetic as Table 4.5 shows, since these are the subjects studied by all pupils. Table 4.4 shows the number of presentations of pupils in the sample studied and the percentage passing in each subject. For comparison the percentages for all Scotland, for pupils of the whole range of ability, are also shown.

TABLE 4.4

PRESENTATIONS AND PERCENTAGES PASSED IN THE VARIOUS SUBJECTS.

Subject	Sample pupils		All Scottish pupils
	Number presented	Percentage passing	Percentage passing
English	390	45	80
History	90	59	73
Geography	93	52	71
Modern Studies	36	69	69
Arithmetic	381	56	80
Mathematics	141	50	77
Applied Mathematics	5	100	77
French	36	42	78
German	2	100	85
Latin	3	0	80
Spanish	4	75	82
Art	84	61	69
Music	4	75	77
Physics	90	61	76
Chemistry	71	63	77
Botany	13	54	64
Zoology	10	50	67
Biology	26	46	62
Applied Mechanics	85	47	66
Technical Drawing	153	62	67
Building Drawing	2	100	73
Woodwork	42	86	81
Metalwork	51	78	81
Home Management	58	67	80
Dress and Design	22	59	74
Anatomy, Physiology and Health	20	75	72
Economic Organisation	3	67	62
Principles of Accounts	96	44	66
Shorthand and Typewriting	106	56	67

Except in a few cases, where the numbers presented were very small, the percentages of the sample pupils passing the examination were substantially less than those for the whole range of pupils. Nevertheless, the percentages passing were mostly over 50 and in some of the practical subjects were on a par with those obtained by the other pupils. This reinforces the commonsense view that a test of verbal reasoning may bear only a slight relation to a test of a specific skill, and that interest or motivation can compensate to some extent for a lack of academic ability.

The marks obtained in the O grade examinations are made available to presenting authorities in the form of bands, each band covering a range of 5 per cent. Table 4.5 shows the attainments of the sample pupils who were successful in the 1966 O grade examinations, and for whom these bands were known. The median score for these pupils in each subject is in bold type.

TABLE 4.5

ATTAINMENTS OF SAMPLE PUPILS IN SPECIFIC SUBJECTS: NUMBERS IN EACH BAND OF PERCENTAGE MARKS.

Percentage mark ...	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	Total
English	**41**	20	5	6					72
History	10	**9**	7	1					27
Geography	**15**	6	2	2		1			26
Modern Studies	6	**6**	1	2					15
Arithmetic	31	8	**34**	14	6	3	2	2	100
Mathematics	4	8	**4**	3	5			1	25
Applied Mathematics	1				1				2
French	**4**	2		1					7
German	**1**								1
Art	7	3	**8**	4		1			23
Music	**2**								2
Physics	6	3	**6**	2	4	6			27
Chemistry	5	1	**11**		1	1			19
Biology	2	1	**1**	1					5
Applied Mechanics	3	4	**3**	2	3	4	1		20
Technical Drawing	4	9	**9**	10	4	4			40
Building Drawing					1	1			2
Woodwork	6	**6**	5	1	1		1		20
Metalwork	4	1	**3**	2	2	1			13
Home Management	3	**7**		1					11
Dress and Design	1			**1**		1			3
Anatomy, Physiology and Health	**1**								1
Econ. Organisation				**2**					2
Princs. of Accounts	8	**4**	5	2	1				20
Shorthand and Typing	2	1	9	**4**	6	1	3	1	27
Totals	167	99	113	61	35	24	7	4	510

It will be observed that the median score is highest in the more practical subjects of technical drawing and metalwork, but that arithmetic, mathematics, physics, chemistry and applied mechanics also show comfortably high medians. The low medians occur in subjects where there were relatively few presentations.

In only one area were the scores of boys and girls recorded separately and in that area the boys were superior to the girls in their attainments.

On the whole the performance of those pupils whose VRQs were below 100, but who had the necessary motivation to continue at school and study for O grade examinations, was satisfactory although the degree of success they obtained was usually below that of the abler pupil.

Change of course.

In some of the areas participating in the inquiry an effort was made to ascertain how many of the pupils under consideration had been originally allocated to non-certificate courses and had been transferred to a certificate course at a later stage in the secondary school. The proportions varied from 43 per cent in Area G to 90 per cent in Area E with Area D in an intermediate position at 67 per cent. This is confirmation of the flexibility of the system to which reference was made in Section 3.

In at least one school it was found that pupils who would have been allocated to non-certificate courses by the transfer scheme previously used were placed in certificate courses on entrance. In two areas the arrangements for reclassification at the end of the second year of the course enabled a substantial number of pupils in non-certificate courses to enter an intensive commercial course from which presentation could be made.

It is clear that, in the years immediately preceding 1965, pupils did transfer from non-certificate to certificate courses. The system of allocation to courses in the areas participating in the investigation appears to have been more flexible than some critics realise.

It was apparent that in all areas there were a few pupils who in transferring to a certificate course repeated one year of secondary education and took the O grade examination in their fifth year. Only in the Area E returns could this group be accurately distinguished and then their performance showed no marked difference from those who changed course and took the examination in their fourth year. It must be noted that this fifth year group was a small one.

Parental occupation and O grade success.

One possible explanation for the success of the under-average pupil is the presence of a superior socio-economic background. One index of this is the father's occupation. The question whether those ' below average ' pupils who gained passes in O grade examinations came from the higher occupational classes was raised.

Unfortunately the descriptions of parental occupations supplied by the pupils were rather vague and inadequate, the data incomplete, and the coding approximate. Nevertheless, it was thought worthwhile to compare the distribution of father's occupation for the sample pupils with a known distribution for fathers of Scottish 13-year-old children (Husén, 1967). The distributions were found to be very similar and there was no indication of a tendency for the successful pupils to be the children of fathers in professional or non-manual occupations.

5.—CONCLUSIONS AND COMMENTS.

The several changes which have been introduced into the certificate which marked the successful completion of secondary education in Scotland have reflected the changing educational pattern of the school system. A major change from the Scottish Leaving Certificate to the Scottish Certificate of Education became necessary because a greater proportion of the population were being given an opportunity to take advantage of the longer courses of secondary education and an increasing number of professional bodies were making use of the certificate as an entrance qualification. When the number of subjects examined was limited, a group certificate had some significance as a guarantee that a reasonable standard of general education had been achieved. The sub-division of subjects, such as the replacement of science by chemistry, physics and biology, and the steadily increasing number of new subjects strengthened the case for the individual subject certificate.

Since its inception in 1962 the O grade of the certificate has provided an educational goal for an increasing number of Scottish pupils, the number of presentations in the various subjects having increased from 176,724 in 1962 to 246,339 in 1968. In terms of pupils being presented in their fourth year there has been a corresponding increase and the proportion of the age-group attempting at least one subject in the fourth year of the secondary course was about 40 per cent in 1968.

With the introduction of the O grade, teachers were given an explicit statement on the standard set by examiners. It was to be such that a pupil at the lower end of the top 30 per cent of an age group should, with satisfactory teaching and adequate effort, have a reasonable prospect of securing, in his fourth year, passes in at least three subjects. This goal has been achieved by many such pupils and, not surprisingly, not a few below this level of ability were also successful.

The impending change of the minimum school leaving age to 16 years necessitates a further review of the character of the certificate. More pupils will be compelled to remain at secondary school for four years: the present transfer arrangements would result in over 80 per cent of an age group completing 4 years of secondary education. It is a reasonable expectation that many of these will be presented for the O grade certificate in at least one subject. If the present standards are retained there will be an increasing number of failures and many pupils will leave school with a sense of frustration.

There are several solutions to this new problem. One would be to provide a different type of certificate for the average pupil, as has been done in England and Wales by the provision of the Certificate of Secondary Education as an alternative to the General Certificate of Education. This is already causing difficulties; teachers and pupils are often uncertain whether to attempt one certificate or the other, and questions of comparability arise.

A second solution would be to lower the standard of the present O grade examination. This in turn would present difficulties to bodies which accept O grade passes as entrance qualifications. The difficulty might be met by awarding O grade passes at different levels which might be indicated by A and B on the certificate. The O grade certificate marked A would be of the present standard of difficulty, and acceptable to some examining bodies, that marked B would represent a pass at a lower standard.

A third solution involves an extension of this idea. It is to award a certificate to everyone who takes the examinations and to indicate by A, B, C, D or E the standard reached. There are two objections to this proposal. The first is that we cannot be sure without further research whether it is possible to construct an examination or test situation which would cover adequately the considerable range of ability and attainment involved. The second is that without further research we cannot say what would be the reliability and the predictive validity of the ratings on an O grade certificate. In other words, how much reliance could we place on, e.g., a B rating given by the Examination Board; and how much faith could a college of further education or an employer place in it as a predictor of success in a course of further education, or in a particular type of employment?

If these objections can be met we may look forward to the day when the great majority of those who leave school at 16 do so with a certificate giving some indication of their attainments in their best subjects.

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EXTENT OF FUTURE TIME ORIENTATION : A CROSS-ETHNIC STUDY AMONG NEW ZEALAND ADOLESCENTS

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SUMMARY. It was predicted that ' European ' New Zealanders in comparison with Maoris would (*a*) tend to have longer future time orientation in respect to major goals and (*b*) show greater tendency to delay gratification. Boys and girls with a mean age of 14 : 3, all in the same grade, form three, from seven schools and of both ethnic groups were asked (*a*) to indicate distance, in time of imagined realisation of major goals, firstly for vaguely specified characters and later for themselves and (*b*) to decide among choices of money which increased in proportion to delay. For boys, both ethnic contrast predictions were strongly confirmed but, for girls, though in the predicted directions, findings either showed generally poorer levels of statistical significance or, for some of the temporal orientation of goals results, lack of significance.

I.—INTRODUCTION : HYPOTHESES.

AMONG other dimensions of ' achievement value ' on the Rosen (1956) model, orientation towards the future, as against towards the present, has been found to correlate positively with degree of higher socio-economic status and with ' over-' in contrast to ' under-' achievement relative to IQ (Sugarman, 1966). Of the components of this ' dimension ' future planning and delay of gratification, the latter was found to have highly significant positive associations with higher academic achievement and with higher occupational aspirations (Straus, 1962). In these reports, the findings, based on the subjects' judgments of items describing ways of behaviour, could be contaminated by the giving of socially acceptable answers or by possibilities of self-deception. However, similar results have been obtained from investigating time reference in everyday thought processes, in expectations of specified events or, with projective assumptions, in story telling, story completion or sentence completion. By the use of such methods, tendencies have been found for lower class subjects to have shorter time perspective than those higher in the socio-economic scale (LeShan 1952 ; Lessing, 1968), and for lower achieving (Teahan, 1957) or lower intelligence (Lessing, 1968) subjects to have less extended time perspective than those performing better. Moreover, not only is length of future time orientation built into the scoring system for achievement motivation as devised by McClelland and his associates, but also there is evidence for a positive association between achievement motivation and extent of future time orientation beyond the achievement motivation context (McClelland, 1961, 327-328).

To the extent that these largely North American findings might be applicable to New Zealand, it may be postulated that Maoris would be less oriented to the future than those identified as ' European ' : Maoris tend to achieve relatively poorly academically (New Zealand, 1960 ; 1962 ; 1965),* tend to be below average in IQ (Lovegrove, 1966) and, on occupational and other indices, are disproportionally ' lower class ' (Thompson, 1963, 29 ; Metge, 1967, 72-81 ; Ritchie, 1968, 288-310). Their relatively high juvenile delinquency rate (New Zealand, 1960 ; New Zealand Educational Institute, 1967) also suggests a liability to succumb to the lures of immediate gratification. In summing up a study of a rural Maori community Ritchie (1963, 176) asserts that the Maori "is not pushed by incorporated aspirations, nor punished by guilt." From observations of what Maoris say and do, Metge (1967, 59-60) describes " concentration of interest on the present rather than the future " and " a happy-go-lucky attitude to time and money," as " distinctively Maori."

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* Stimulated by official reports (e.g., New Zealand 1960 ; 1962), increasing attention has been given in New Zealand during the 1960s to setting in motion special measures, beginning with the pre-school years, to raise the academic achievement and intellectual functioning levels of Maoris, the ethnic group of Polynesian pre-European inhabitants.

Accordingly, two hypotheses were proposed:

(*a*) In respect to especially valued goals, ' European ' New Zealanders tend to have longer future time orientation than Maoris.

(*b*) ' European ' New Zealanders tend to delay gratification opportunities more than Maoris.

Apparently in conflict with the foregoing evidence and with Hypothesis (*a*), Ausubel (1961) concluded that Maori boys tended to resemble ' European ' boys in respect to academic and occupational aspirations. However, apart from the smallness of the sample, levelling effects might be inferred both because of matching, which resulted in a low mean IQ for non-Maoris as well as for Maoris, and because the Maori group, whose mean age exceeded the minimum leaving age, was likely to be a biased sample. Moreover, how, as compared with other goals, were academic or occupational aspirations valued by each ethnic group? Hypothesis (*a*) leaves open the nature of goal that may be perceived as especially important.

II.—SAMPLING.

With the minimum leaving age for compulsory schooling at 15 years, form three, the first secondary school year in New Zealand, was the upper limit beyond which results would tend to be unduly biased from early leaving: some 2 per cent of non-Maoris and 6 per cent of Maoris might be expected not to reach secondary school and some 9 per cent of non-Maoris and 25 per cent of Maoris not to go on to commence their fourth-form year (New Zealand, 1962, 406-408). Accordingly, the instrument devised to test the hypotheses was given to pupils present in all third form classes throughout the seven schools visited between 6th—18th November, 1968, thus reasonably distant from Christmas with its long Summer vacation marking the end of the school year. Since, because of much racial intermarriage, individual choice may play a part as to whether one describes oneself as a Maori (Metge, 1967, 52-65 ; Harre, 1968, 118-131), the pupils, 604 in number, were asked to indicate whether they were ' Pakeha (European or white person),' ' Maori,' ' Partly Pakeha and Maori,' 'Another race.' To obtain the sample analysed in this paper and shown in Table 1, respondents from the latter two categories were discarded, as were also, on grounds such as not adequately following instructions, four ' European ' boys, six Maori boys, two ' European ' girls, six Maori girls. Table 1, gives mean ages (with frequencies of those aged beyond 15 years, entitled, therefore, to leave school) and distribution among schools. The schools were chosen to obtain a relatively high proportion of Maoris who numbered approximately 8 per cent of the New Zealand population (New Zealand, 1962, 409) ; to reflect the almost equal proportion of Maoris who inhabited town and country (New Zealand, 1968, 74) ; and to cover widely separate areas through the North Island where over 90 per cent of Maoris lived (Metge, 1967, 66-71). Those of the ' European ' category were less adequately represented demographically but form a more homogeneous population than do Maoris who retain in varying degrees Maori attitudes and ways of life in combination with those derived from the culture of Europeans.

TABLE 1

COMPOSITION OF SAMPLE.

School*	Boys						Girls					
	European			Maori			European			Maori		
	N	Mean IQ	N(R)	N	Mean IQ	N(R)	N	Mean IQ	N(R)	N	Mean IQ	N(R)
City	43	109	32	21	89	15	44	110	38	25	96	12
Town (1)	31	99	28	49	83	47	39	104	35	31	84	28
Town (2)	31	104	23	4	90	3	39	101	36	5	94	5
Rural (1+2)	14	99	13	11	82	9	19	105	19	8	84	8
Boarding (B ; G)				9	88	7				11	91	10
Totals	119			94			141			80		
Mean age	14 : 2			14 : 8			14 : 0			14 : 5		
N over 15	5			22			3			9		

**Schools* : (i) State co-educational non-selective (most common type) : City—in Auckland, the largest city ; Town (1) and (2)—in small towns, with town and country pupils ; Rural (1) and (2)—in small country settlements ; (ii) Boarding (B) and (G)—small single-sex boarding schools under church control.

N(R) shows number of IQs recorded from which means were derived.

The mean IQs shown in Table 1 derive from a New Zealand standardisation of the Otis test in which Maori pupils were under-represented (Redmond and Davies, 1940) and, except for one boarding school specially tested, were obtained, where available, from school records. Testing had been as far back as three years previously but was mostly around one year beforehand. Though reliability may be somewhat suspect, the results accord with usual findings of significantly lower IQs among Maoris even where attempts have been made to match with ' European ' New Zealanders on such a criterion as parental occupation (Lovegrove, 1966). As an index of current achievement, using a mean IQ of 98 as a cut-off point between ' higher ' and ' lower ' streamed classes, 77 per cent of ' European ' boys and 66 per cent of ' European ' girls as against 38 per cent of Maori boys and 28 per cent of Maori girls were in ' higher ' classes in the City school. Corresponding percentages for the larger country town school (Town–1) are respectively : 55 per cent, 69 per cent, 6 per cent, 16 per cent.

III.—PROCEDURES.

Questions designed to test the hypotheses were answered on sets of question-response sheets by each subject as a member of a school class. To aid poor readers and promote concentration, the investigator read aloud the questions which the pupils had before them on their copies.

To Test Hypothesis (a).

In attitudinal assessment there are hazards in including specific details. Thus, a negative association of future time perspective with age (Lessing, 1968) was largely an artefact of her ' Events Test ' since there tended to be fixed age expectations when subjects would attain such milestones as driver's licence, high school graduation and marriage. Further, a specified time of day in the Incomplete Story Test seemed to influence subjects towards a short time span for the story. To test Hypothesis (*a*), it has been aimed to avoid such detail and to combine openness as to choice of major goal with structuring of responses, as in this general question relating to the self (*Self*: *General*):

> Now think of something that you, yourself, *want to happen more than anything else*. *How soon* do you think of this as happening?
>
> In less than one week
> In 1 to 4 weeks
> In 1 to 6 months
> In 6 months to 1 year
> In 1 to 5 years
> In 5 to 10 years
> Longer than 10 years

In a pilot study, responses to a similar general question were occasionally described as relating to such conservative or restitutional desires as: " that the world will not come to an end," " that my father will come back." In general, however, the desires were concerned with individual doing and receiving, categories that might be expected to relate to achievement values. Thus, as well as the general question, which allowed for maximum diversity of major goals, two questions, with the same temporal choices as for *Self*: *General* but with modified stems, were posed, respectively *Self*: *Doing* and *Self*: *Given*:

> Among the things that you most want to happen, think of what you would *most want to do*. *How soon* would you think of doing this?

> Among the things that you most want to happen, think of what you would *most want to receive or be given*. *How soon* would you think of this as happening?

Further, a method found promising whereby self-report responses were preceded by responses imputed to others (Bray, 1964) was adapted and developed. It was aimed by this strategy to establish rapport and co-operation of subjects so that there might be less resistance to self-report which, moreover, because of familiarity with procedures, might be done speedily without allowing time for doubts and hesitations. There would also be additional information which might be interpreted projectively. With the same temporal choices as those described for the self, questions were framed for two persons, ' Z ' and ' X.' To commence at distance from the self, the first question asked began, " Now think of somebody of a different age from you, either younger or older, and the sort of wants this person might have. Let's call this person Z." For this person, the question, *Other-Age*: *General*, was asked:

> There is something that Z *most wants* to happen. *How soon* is Z thinking of this as happening?

Next, for ' X,' ' of about your own age,' the same three types of question as were to follow later for the self (i.e., *Self*: *General, Doing, Given*) were posed and are designated respectively *Near-Age*: *General, Doing, Given*, e.g., to illustrate by the second of these (i.e., *Near-Age*: *Doing*):

> Among the things that X most wants to happen, there is something that X *most wants to do*. *How soon* is X thinking of doing this?

In Table 2, as in other tables, the questions are shown in the order in which they were asked.

To foster from the start a set towards reality, a preparatory practice example had asked subjects to choose among imagined highly desired wants in the categories, ' fairly sure will happen ' and ' doubtful if it could happen .' To sustain this set and to assess feasibility as perceived, each of the seven questions to test Hypothesis (*a*) was followed by a question, appropriately modified for ' X ' and ' you,' of the form :

How does Z *feel about its going to happen* ?
Is sure it will happen.
Thinks it probably will happen.
Is doubtful but it could happen.
Thinks it probably won't happen
Is sure it won't happen

With the addition of ' *Expect*,' these expectation questions are designated (Table 4) in the same way as the questions they immediately followed.

To encourage adherence to the instructions to think of main ' wants ' and discourage meaningless marking of multiple-choice questions, subjects were asked to write what these wants were, in the form : " What is it that Z most wants to happen ? " Since reluctance to describe main wants might inhibit and difficulties of expression might worry or delay, description of these wants, except in the one case of introducing the person, ' X,' followed the temporal and expectation multiple-choice questions. It was recognised that described wants might not always be those thought of when answering the multiple-choice questions.

To Test Hypothesis (*b*).

As used by Rosen, Sugarman or Straus to assess achievement values or specifically delay of gratification, agreement or otherwise with such an item as " You have to give up having a good time now to do well later on," may largely measure degree of willingness to acquiesce with a socially acceptable answer. Tests of overt behaviour, even where practicable, are not necessarily preferable. Thus, the Delayed Gratification Test of Mischel (1958 ; Vernon, 1969, 132-133) in which a choice is given between a lesser amount of ' candy ' or chocolate immediately and a larger amount in around a week's time, has been interpreted as largely indicative of how far testers were trusted to keep their word (Vernon, 1969, 144).

Using money choices, the comparability of which was based on a pilot trial, the present study avoided such emotive expressions as ' to do well ' and merely varied time against size of reward for delay. There were two questions. In the Smaller Range Reward of Delay question, one option (i.e. ' now ') involved no delay but in the next question offering Larger Range Reward, delay was built into all possible choices.

The former question stated :

If you were given some money, which would you prefer :
10 dollars now
14 dollars in one month
18 dollars in three months
22 dollars in six months
28 dollars in one year ?

The Larger Range Reward of Delay question was :

If you were given these choices of waiting for different amounts of money, which one would you prefer :
Waiting one week for 40 dollars.
Waiting one month for 50 dollars

Waiting six months for 70 dollars
Waiting one year for 90 dollars
Waiting two years for 120 dollars.

IV.—ANALYSIS AND DISCUSSION OF RESULTS.

The goal distance percentages in Table 2 show the main trends as to temporal orientation of goals. As a general pattern, percentage choice for goals within one month increases in the order, 'European' boys, 'European' girls, Maori girls, Maori boys and decreases in the same order for goals at a distance of one year or more. Within the 14 resulting series, there are only six cases of lack of progression in these directions and these only between pairs of percentages adjacent in the series. The trend of results thus supports Hypothesis (*a*) for both boys and girls, but, as also shown in Table 2, much more emphatically for boys, as borne out by the χ^2 tests of significance and contingency co-efficients taken out over six goal distance intervals, the two longest of the seven intervals being combined to give sufficient theoretical cell frequencies. It may be noted that one-tailed determination of Ps is used here and subsequently to test the hypotheses.

TABLE 2

TIME ORIENTATION OF GOALS.

Person : Question	Ethnic Group	Boys				Girls			
		Goal Distance% 1– mths	1 to 12 mths	1+ yrs	P* C in [ ] (df=5)	Goal Distance % 1– mths	1 to 12 mths	1+ yrs	P* C in [ ] (df=5)
Other Age :	European	32	32	37	·005	36	30	34	NS
General	Maori	52	19	29	[·26]	39	34	28	
Near-Age .	European	17	25	58	·001	22	25	53	NS
General	Maori	45	26	29	[·32]	36	24	40	
Near Age :	European	24	23	53	·001	33	27	40	NS
Doing	Maori	41	35	23	[·30]	33	37	30	
Near-Age :	European	18	42	40	·001	34	41	25	NS
Given	Maori	58	25	17	[·39]	40	35	26	
Self :	European	18	30	52	·001	30	17	53	·10
General	Maori	47	23	30	[·33]	43	16	41	[·18]
Self :	European	25	22	53	·005	21	25	55	·025
Doing	Maori	43	28	30	[·28]	40	20	40	[·22]
Self :	European	17	30	53	·001	24	36	41	·05
Given	Maori	47	26	27	[·37]	39	25	36	[·21]

* One-tailed tests.

Range, over the seven questions, of numbers of recorded responses : Boys—European : 114–119 ; Boys—Maori : 92–94 ; Girls—European : 137–141 ; Girls—Maori : 78–80.

In financial reward of delay, as shown in Table 3, there was similarity of response between sexes within ethnic groups. Thus, ethnic contrast among girls was not very markedly less than among boys and χ^2 results for both sexes significantly supported Hypothesis (*b*), more strongly for the larger range than for the smaller range question.

It would, however, be possible for the results, apparently supporting both hypotheses, to have been influenced by subtly different administration to mainly European, in contrast to mainly Maori, classes, since the investigator read aloud

TABLE 3

FINANCIAL REWARD OF DELAY.

Reward	Sex	Ethnic Group	Periods Chosen : %					N(R)	P* C in [ ] (df=3)
			Now	1 mth	3 mths	6 mths	1 yr		
Smaller : $10 to $28	Boys	European	33	19	2	9	36	118	·005
		Maori	54	19	5	3	18	94	[·23]
	Girls	European	33	25	6	4	31	140	·10
		Maori	47	24	8	3	18	78	[·17]
			1 wk	1 mth	6 mths	1 yr	2 yrs		
Larger : $40 to $120	Boys	European	25	8	7	9	50	118	·001
		Maori	53	19	6	3	18	93	[·36]
	Girls	European	24	14	4	7	51	140	·001
		Maori	46	22	6	8	18	78	[·31]

* One-tailed tests : f's for three and six months for smaller reward, and for six months and one year for larger reward, were combined in contingency tables. N(R) = number of recorded responses.

all questions and could have inadvertently suggested responses. Accordingly, using the same statistical procedures, but with reduction of contingency table cells to secure adequate frequencies, separate analyses were made covering classes having half or more Maoris, comprising 19 'European' boys, 67 Maori boys, 22 'European' girls, 54 Maori girls, and covering the remainder, the less than half Maori sub-sample. For both sub-samples, boys' time orientation of goals responses gave five (out of the possible seven) significant X^2 results (2df) in the postulated direction : two at ·05 and three between ·025 and ·001 and one other where P=·10. A similar analysis for girls gave Ps at ·10 or less only for the fewer than half Maori classes but, of three altogether, only one (P=·025) at a more significant level than ·10. These results tend to correspond to the generally low degree of significant relationship shown for girls in Table 2. For each of the reward of delay questions, X^2 results (2df) with P at ·10 or better in the postulated direction were obtained over both sub-samples for both sexes : in the less than half Maori sub-sample, P=·025 for the smaller range girls' result and P=·005 for the remaining three results ; among the half or more Maori classes, P=·005 for the larger range male result and ·10 for the remainder. Though Ps tend to be less significant for the latter sub-sample, Cs for this sub-sample of ·20 and ·33 for boys and ·23 and ·21 for girls do not differ greatly from those for the less than half Maori classes, respectively, ·28 and ·27, and ·20 and ·27. Since , then, a possible variability in administration between the two sub-samples has not been such as to destroy the significant direction of the findings, these may, with greater confidence, be held to support the hypotheses and, because of the rationale on which they were based, the validity of the procedures. Of other possible spurious factors, that of variable subjective interpretation of what is read might be expected to be minimised by having had subjects formulate their own goal items. That of heightened defensiveness or social acceptability in self-report would not appear to have unduly influenced goal orientation results for boys (Table 2), for whom, in contrast to girls, ethnic divergence results were consistently highly significant on the *Self* questions but were also highly significant, with similar contingency co-efficients, on the preceding questions about unspecified persons.

While the ' projective ' type preparation may have helped reduce self-defensiveness, it seems that, except by giving corroborative evidence, the differences in goal orientation questions, *General, Doing, Given,* were scarcely worth while, since all gave rather similar ethnic contrast results. In the change from a different to a near age character, there was (as shown in the percentage choices of Table 2) some movement away from shorter to longer goals but only slightly for Maoris ; ' European ' boys, notably, tended to maintain this change orientation over the remaining goals questions.

Distribution of temporal orientation frequencies was non-parametric. Delay of reward showed a U-shaped curve with marked dichotomy between those wanting gratification very soon and those electing to wait for the maximum period with maximum reward. Distribution of goal orientation responses was fairly even, though, since intervals increased, declining frequency with length of time could be inferred. The extent of individual differences running counter to ethnic trends may be illustrated by the fact that there were never less than 17 per cent of ' European ' boys looking to main goals within one month and than 17 per cent of Maori boys envisaging goals one or more years away.

Subjects tended to perceive the main goals they had in mind as realistic. Throughout all seven questions and over all sex-ethnic groups, no more than 17 per cent of responses fell within the ' Probably won't ' and ' Sure won't ' categories combined. Responses were distributed fairly evenly over the remaining three categories, with slight tendencies for ' Europeans ' to choose more often ' Probably will,' for Maori girls to choose more often ' Doubtful ' and for Maori boys to vary between these two modes. Table 4 shows the results for boys.

TABLE 4

BOYS' EXPECTATIONS OF REALISING GOALS : PERCENTAGES

Person : Question	European Boys					Maori Boys				
	Sure will	Probably will	Doubtful	Probably won't	Sure won't	Sure will	Probably will	Doubtful	Probably won't	Sure won't
Other-Age :										
General-Expect	30	43	24	3	1	28	20	39	7	5
Near-Age :										
General-Expect	34	38	24	3	1	29	28	33	8	2
Doing-Expect	37	41	18	4	—	32	32	25	10	1
Given-Expect	25	35	32	7	1	29	38	27	6	—
Self :										
General-Expect	30	32	32	5	1	31	33	28	7	1
Doing-Expect	28	42	21	9	—	22	36	34	5	2
Given-Expect	16	33	34	14	3	19	28	40	13	—

Range, over the seven questions, of numbers of recorded responses :
Boys—European : 118–119 ; Boys—Maori : 92–94.

To throw some light on how far the differences in time orientation might be related to the lower intellectual functioning of the Maori subjects, school classes were divided into higher and lower ability sub-samples based on a mean class IQ cut-off point of 92 which allowed adequate frequencies in 2×3 tables. Using the same statistical methods as previously to investigate the postulated trends by one-tailed tests within the two sub-samples, the results (2df) were not greatly different from those already outlined for the half or more Maori and remainder sub-samples. For example, in the boys' lower ability sub-sample, out of the seven time orientation of goals χ^2 results, there was one P at each of ·001, ·01, ·05 and ·10 levels and two were at the ·005 level.

No attempt is made in this paper to determine how far the ethnic contrast findings may be attributable to distinctively Maori values and how far to socio-economic status. It may, however, be commented that socio-economic status in the markedly egalitarian society of New Zealand may well have some implications dissimilar from elsewhere.

Limited by the age level and degree of representativeness of the sample, the findings require testing by wider replication. So far as they go, they suggest that particularly for Maori adolescent boys, but also for many other pupils, teachers need to allow for restricted temporal orientation as, indeed, they do when they set up short term intermediate goals for those in their charge. When plentiful success attends such goals, the teacher or parent is likely to be fostering increased acceptance of delay of reward, of frustration tolerance, in the service of goals increasingly remote.

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RESEARCH NOTES

SOME EVIDENCE ON THE INTERACTION BETWEEN TEACHING STRATEGY AND PERSONALITY

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SUMMARY. The investigation was concerned with possible interactions between teaching strategy and personality differences among children learning mathematics in the early years of secondary school. Part of a text in extensive current classroom use was the basis of learning material structured so that the effect of giving rules before or after examples could be revealed.

Throughout the experiment introverts were superior in performance when rules were presented before examples and extraverts were superior when rules were presented after examples. This interaction was significant for all three dependent variables of 'original' learning, 'retention' and 'transfer.' When two levels of anxiety and two levels of intelligence were examined separately a similar treatments x extraversion interaction appeared within every analysis, whatever the dependent variable, reaching significance in several instances.

I.—INTRODUCTION.

Results have already been reported of an interaction of mode of learning with level of anxiety, for children of 10 and 11 years of age doing 'odd man out' problems, by Leith and Bossett (1967), and of an interaction with extraversion-introversion for first-year college of education students, using a programme in genetics, by Shadbolt and Leith (1967). It would begin to appear, therefore, that any treatment-personality interaction may be far from being a well established once-and-for-all affair over age, learning material, duration of learning experience, etc.

II.—PROCEDURE.

Sixteen programmed sections of examples, together with 16 associated rules were based, with permission, on pages 71 to 75 of the Midlands Mathematical Experiment Book One (1964). This restructured learning material, dealing with the definition and elementary algebra of vectors, had been validated with over 250 11- and 12-year-olds of all ability levels.

The subjects, the entire second year of two co-educational Leicestershire Plan junior high schools, were aged between 11 years 8 months and 13 years 4 months at the time of the administration of the learning material and covered the whole ability range. None had used the relevant text before, nor, to the knowledge of their teachers, had any previously met the subject matter elsewhere. The preliminary tests consisted of the H.B. Personality Inventory (Hallworth, 1962), Raven's Matrices (1960) and a pre-test designed to test knowledge of, and especially ability to apply, the rules contained within the learning material. Dichotomies were created about the median scores on the orthogonal scales of extraversion and anxiety and about the median score on intelligence. Thus, 32 cells had been created, eight within each school/sex group, each cell containing 10 or more members. 10 members of each cell were then selected at random and allocated randomly to each of 10 teaching strategies, giving an experimental group of 320 children. Four of these teaching strategies had been designed to give rise to data on the effect of giving rules before or after examples. 128 children were allocated to these four groups, 32 to each.

The four treatments were defined as follows :

Treatment 1 : First rule read and then first programmed section of examples worked ; second rule read and then second programmed section of examples worked.
Treatment 2 : First programmed section of examples worked and then first rule read ; second programmed section of examples worked and then second rule read.

Treatment 3 : First two rules read and then first two programmed sections of examples worked.

Treatment 4 : First two programmed sections of examples worked and then first two rules read.

Thus, all four treatments were concerned with two sections of programmed examples and the rules associated with them, per lesson for each of eight lessons One school worked throughout in exactly this way. Within the other, which had shorter mathematics periods, it was found to be more convenient for each child to pass on to the next section as soon as he had finished the previous one, always working in the prescribed manner. Two mathematics lessons were devoted to the experiment each week and in each school the learning period was completed in four weeks.

A post-test, identical to the pre-test, was administered in the fifth week and again nine weeks later. ' Original ' learning was measured by the percentage gain from pre-test to post-test score in the fifth week, and ' retained ' learning by the percentage gain from pre-test to post-test score after the further nine weeks. In order that a dependent variable reflecting degree of transfer should also be available, a transfer test, on a new but related learning task, the subtraction of vectors, was administered in the fifth week. Of the 128 children who had been allocated to relevant teaching strategies four were ' lost ' to the experiment by the time of the post- and transfer tests and two more by the time of the retention test. In all cases missing scores were replaced by the mean of the whole experimental group on that measure.

III.—RESULTS.

The mean pre-test score for the whole experimental group was 9·84 per cent (N=320).

Table 1 shows the mean percentage scores for all three dependent variables for treatments, involving ' rules before ' (i.e., 1 and 3) and ' rules after ' (i.e., 2 and 4).

TABLE 1

MEAN PERCENTAGE SCORES ON ALL THREE MEASURES.

	Treatments 1 and 3 (N=64)	Treatments 2 and 4 (N=64)
' Original ' Learning	40·45	42·55
' Retained ' Learning	38·72	38·03
' Transfer '	33·57	39·48

Introverts were superior when rules were presented before examples and extraverts were superior when rules were presented after examples. This interaction was significant for all three dependent variables.

When high intelligence subjects were considered alone the treatments *x* extraversion interaction was highly significant for ' transfer ' and significant for ' original ' learning while for low intelligence subjects it was significant for ' retained ' learning.

When high anxiety subjects were considered alone the treatments *x* extraversion interaction was significant for ' retained ' learning while for low anxiety subjects it was significant for ' transfer.'

IV.—CONCLUSIONS.

Even if consideration of possible interactions between optimum teaching strategy and personality is confined to the question of the relative effectiveness of rules before or rules after examples, it would be unwise, at this stage, to try to make any kind of categorical statement. Although the interaction which appeared in the present study was a most persistent one, much may depend on factors not yet appreciated. It is obvious, however, that when there is, ultimately, enough evidence to approach an adequate prescriptive theory of instruction, it will not be a once-for-all-children or once-for-all-material affair. Within such a relative theory, the matching of teaching strategy to personality will undoubtedly play a part. The evidence available from the present study suggests that consideration, within the secondary school, of the child's level of extraversion may prove to be a significant factor within such a matching.

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CHANGES IN THE SELF CONCEPTS OF SCHOOL-LEAVERS WHO PARTICIPATED IN AN ARCTIC EXPEDITION

BY J. PAYNE, A. W. DRUMMOND AND M. LUNGHI*

SUMMARY. Questionnaires designed to measure some aspects of personality and self concept were administered to the 35 male school-leavers of an Arctic training expedition both prior to departure and on their return. The same procedure was carried out with a control group of equal size. The results showed that those volunteering for the expedition were significantly more extravert than the general population of students and that in those who participated there was a significant reduction in the discrepancy between self description and ideal self description by the end of the expedition.

I.—INTRODUCTION.

A considerable investment in time and money is made in this country in training schemes which have character training as their primary task. Well-known examples of this genre are the Outward Bound Schools and the British Schools Exploring Society. Both these organisations have devised schemes which aim at pushing the individual to near his physical limits. Until recently there has been rather less effort invested in testing the validity of these schemes in terms of their primary task of inducing change in individuals.

A common assumption is that acquiring new skills and overcoming demanding physical circumstances which are central to these schemes will result in feelings of increased assurance and self worth. In a recent survey Clifford and Clifford (1967) reported the effect on 36 boys of spending a month at an American Outward Bound School. They used three measures of self concept devised by Dickey (1958, 1961) and reported increased feelings of self worth and competence as the result of the experience.

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The present study aimed to replicate that of Clifford and Clifford on English boys and to extend it in two main directions:

(a) A control group was introduced so that any change that occurred could be reliably attributed to the experience undergone by the experimental group and could not be attributed to the passage of time or being on holiday.

(b) Two aspects of personality, neuroticism and extraversion, were measured on both experimental and control groups. These seemed relevant as the effect of the experience could well be a function of the personality of the applicant as well as his reasons for seeking the experience.

Two main hypotheses were tested: (1) the experience of being challenged to the limits of one's capacities will result in increased feelings of self worth and competence; (2) that the experimental and control groups will score higher for extraversion on the Eysenck Personality Inventory compared with university students in the same age group.

II.—PROCEDURE.

In the Summer of 1968 the British Schools Exploring Society sent an expedition to Spitsbergen under the leadership of one of the authors (J.P.). The expedition was of one month's duration and required the completion of scientific projects which were both physically and intellectually demanding.

All the participants (N=35) were volunteers and were selected by an interview supplemented by headmasters' reports. The control group (N=34) were chosen from those applicants who most narrowly failed selection. The applicants were either school-leavers or police cadets between the ages of 17½ and 19½. The schoolboys came from public, grammar or comprehensive schools and from widely differing socio-economic backgrounds.

Two weeks before the departure of the expedition and again on its return both experimental and control groups completed the following questionnaires:

Eysenck Personality Inventory (*EPI*) (Eysenck and Eysenck, 1964). This is a widely used questionnaire which provides scores for neuroticism and extraversion; form A was used.

Self rating scale (*SR*) (Dickey, 1958, 1961). This scale was used as a measure of self esteem and consists of 15 statements about the self each of which is rated on a 7-point scale according to how frequently it applies. Scores can range from a minimum of 15 (positive self acceptance) to a maximum of 105 (negative self acceptance).

Self description scale (*SD*) (Dickey, 1958). This measure consists of 34 adjectives and phrases each of which is rated for applicability to the self on a seven-point scale. In the original work, the descriptions were rated for desirability (Dickey, 1958) so that the minimum score of 34 may be taken as showing a positive self description, whilst the maximum of 238 shows a negative description. Some of these ratings, e.g., the positive rating for aggression, may be peculiar to the American culture.

Ideal description scale (*ID*) (Dickey, 1958). Here the subjects are asked to rate the adjectives used above, as they would like to be, i.e., for the ideal self. The scoring is identical to that of the self description scale.

III.—RESULTS.

Over the six-week period the self rating, self description and ideal description scales showed stability coefficients of ·78, ·84 and ·63, respectively. At the initial testing, the inter-scale correlations were SR and SD, ·75; SR and ID, ·12; and SD and ID, ·51. The discrepancy between SD and ID (irrespective of sign) correlated ·73 with SR, ·59 with SD, ·59 with neuroticism and ·26 with extraversion at initial testing.

Self rating scale: Whereas Clifford and Clifford found a significant decrease in the self rating on the final testing, the authors found no significant change. The mean SR on initial testing was: experimental group 40·63, control group 41·85; and on final testing: experimental group 40·29, control group 42·34. Neither of the differences between initial and final testing is significant.

Self description scale: Table 1 presents the mean scores on the self description scale before and after the expedition for both the experimental and control groups. In accordance with the method followed by Clifford and Clifford (whose results are given for comparison) each group was divided at the median of the initial self rating into those with a 'poorer' self rating and those with a 'better' self rating, and results are given for each of these sub-groups as well as for each group as a whole. At initial testing, control and experimental groups do not differ significantly, whilst the difference is significant at the final testing ($P<\cdot 05$, one-tailed). This substantiates Clifford and Clifford's findings.

TABLE 1

MEAN SELF DESCRIPTIONS AT INITIAL AND FINAL TESTING.

Group	SR group (split at median)	Initial SD	Final SD	t
Experimental (Clifford and Clifford)	Poorer (N=18)	121·72	113·39	2·707*
	Better (N=18)	99·89	90·94	1·837
	Total (N=36)	110·80	102·16	3·053*
Experimental (present study)	Poorer (N=17)	114·18	112·44	·816
	Better (N=18)	91·67	88·83	·829
	Total (N=35)	102·60	97·09	2·977**
Control (present study)	Poorer (N=17)	119·71	121·13	·404
	Better (N=17)	93·65	95·25	·612
	Total (N=34)	106·68	108·19	·520

The lower the score, the more favourable the self description.

* $P<\cdot 05$. ** $P<\cdot 01$.

Ideal description scale: Table 2 shows that the ideal self description for the experimental group is significantly less favourable on retesting, although it should be noted that no significant differences occur between the experimental and control groups. In other words, the change manifested by the experimental group should not be attributed to the experience of the expedition alone.

Self ideal discrepancy: In Table 3, the initial and final discrepancy scores between the self and the ideal self descriptions are given. Here again, the control group showed no significant changes whilst the experimental group showed a significant reduction in the self-ideal discrepancy ($P<\cdot 02$).

One can sum up the results of Tables 1–3 by saying that the experimental group came to describe themselves more approvingly and to describe a more realistic and more attainable ideal self: that is, they had moved a little towards their ideal and their ideal had moved a little towards themselves.

Finally, since it seemed likely that change would be related to both personality and social variables, the changes in ratings and descriptions were further compared between groups of public school, grammar school and police cadet subjects. None of the correlations was at a significant level, whilst the comparisons of means are shown in Table 4.

TABLE 2

MEAN IDEAL DESCRIPTIONS AT INITIAL AND FINAL TESTING.

	SR group (split at median)	Initial ID	Final ID	t
Experimental (Clifford and Clifford)	Poorer (N=18)	75·06	73·83	—
	Better (N=18)	63·83	64·50	—
	Total (N=36)	69·44	70·67	—
Experimental (present study)	Poorer (N=17)	72·35	78·53	2·290*
	Better (N=18)	63·72	64·78	·782
	Total (N=35)	67·91	71·46	2·328*
Control (present study) . .	Poorer (N=17)	74·65	78·31	·721
	Better (N=17)	72·47	74·44	·553
	Total (N=34)	73·56	76·38	·451

The lower the score, the more favourable the ideal description.

* P<·05

TABLE 3

MEAN DISCREPANCIES BETWEEN IDEAL AND SELF DESCRIPTIONS.

Group	SR Group (split at median)	Initial discrepancy	Final discrepancy	t
Experimental	Poorer (N=17)	41·82	35·19	2·40*
	Better (N=18)	27·94	24·06	1·29
	Total (N=35)	34·69	29·29	2·68†
Control	Poorer (N=17)	45·06	42·81	0·38
	Better (N=17)	20·18	20·88	0·22
	Total (N=34)	33·12	31·84	0·22

* P<·05 † P<·02

The small group of four police cadets showed a significantly more favourable change in self description (t=2·58 ; P<·05) and in ideal self description (t=2·59 ; P<·05) than the public school group. The grammar school group also showed a more favourable change of ideal self description (t=4·51 , P<·001) than the public school group

TABLE 4

MEAN CHANGES IN SELF RATING (SR), SELF DESCRIPTION (SD), IDEAL SELF DESCRIPTION (ID), and SD—ID FOR THREE EXPERIMENTAL GROUPS.

	SR 1—SR 2	SD 1—SD 2	ID 1—ID 2	(SD—ID) 1—(SD—ID) 2
Public school (N=11) . . .	—2·55	—1·10	—16·18	5·70
Grammar school (N=19) . .	1·42	1·53	0·32	3·67
Police cadet (N=4)	4·25	10·25	0·25	10·00

As may be seen from Table 4, the significant differences involving changes in the ideal self description arise from the marked lowering of this by the public school group, rather than from an increase for the other two groups.

As far as comparisons between these groups on the initial test data are concerned, the only significant differences are between public school boys and police cadets. The latter group had a more favourable self description ($t=2{\cdot}113$; $P<{\cdot}05$) and a higher extraversion score ($t=2{\cdot}21$; $P<{\cdot}05$).

Eysenck Personality Inventory: Table 5 shows the EPI scores of the combined control and experimental groups compared with norms for Sussex University male undergraduates tested at intake. Sussex students give a significantly lower extraversion value ($t=3{\cdot}665$; $P<{\cdot}001$).

TABLE 5

MEAN SCORES ON THE EYSENCK PERSONALITY INVENTORY FOR SUSSEX STUDENTS AND THE TOTAL SPITSBERGEN SAMPLE.

		Neur.	Extrav.
Sussex undergraduates (male)............	X	9·150	11·440
	SD	4·525	4·423
	N	1095	1095
Total Spitsbergen sample	X	8·986	13·429
	SD	4·751	3·983
	N	69	69
	t	NS	3·665

IV.—DISCUSSION.

The interesting fact that emerged from this study is that changes did occur in the participants. That this is due to the experience of the expedition is substantiated by the fact that no changes occurred in the control group.

In the total experimental group the discrepancy between their self and their ideal self descriptions diminished by a change in both percepts rather than in one or other. However, when the group is broken down into public school, grammar school and police cadet sub-groups, it becomes clear that this is an over-simplification (though the numbers in the sub-groups are admittedly small). In the public school sub-group there is a notable diminution in their ideal self at the end of the expedition, whilst the grammar school boys and police cadets have markedly improved their self descriptions and are responsible for the significant improvement of this in the whole group.

This does not substantiate the findings of Clifford and Clifford who found that it was the self rating that changed and the ideal self rating which remained constant. It does suggest that change occurs in more than one way and these findings should make us think more clearly about the mechanisms of change within individuals as a result of experiences of this nature. It seems from our findings that socio-economic factors and type of school attended are important background variables.

ACKNOWLEDGMENT.—The author would like to thank the Newcastle Regional Hospital Board for a grant which made this research possible.

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(*Manuscript received 15th September*, 1969)

EDUCATIONAL CHARACTERISTICS OF BRIGHT DELINQUENTS

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Summary. The educational characteristics of 50 delinquent boys of superior intelligence were examined. Whilst a few boys had achieved limited educational success, the majority were found to be under-functioning educationally, as shown by inappropriate school placements, poor school attendance, low levels of attainment in public examinations, and unsatisfactory relationships at school. In these respects, the bright delinquents were generally similar to a control series of delinquents of average intelligence.

I.—Introduction.

Apart from descriptive accounts by Burt (1944) and Simmons (1956, 1962), and a retrospective study by Caplan and Powell (1964), little is known about the characteristics of intellectually gifted children who turn to delinquency. The present authors have described in detail elsewhere (Gath *et al.*, 1970) a comparative prospective study of two groups of delinquent boys, one of superior and the other of average intelligence. The two groups were found to be largely similar in social and criminological characteristics but a greater severity of psychiatric disturbance was found amongst the bright boys.

This report summarises the main educational findings.

II.—Method.

The subjects were boys remanded to the London Remand Home for assessment during the period May—November 1967. The index group of superior intelligence comprised a consecutive series of 50 boys achieving a full scale IQ score of 115 or over on the age-appropriate form of the Wechsler Scale. The control series was made up of 50 boys of average intelligence (full scale IQ within the range 90–105), matched in respect of age, ethnic origin and court of referral. Information about each boy's educational attainment and attitudes to school was compiled in two ways :

(1) Reports from schools were examined together with reports from probation officers and other sources.

(2) Standardised interviews with each boy were carried out by psychiatrists and a psychologist, and with parents by psychiatric social workers.

III.—RESULTS.

Psychometry.

During the six-month period of this study, intelligence test results were available for 639 of a total 669 boys remanded in the London Remand Home.

The index series of boys therefore comprised 7·8 per cent of all those tested. The mean full scale IQ of the 639 boys tested was 97·2, of the control series, 96·8 (range 90–105 by definition) and of the index series 126·2 (range 115–139).

Reading Ability.

The Schonell Graded Word Reading Test (Vernon's Revised Norms) was administered to all boys in both series. As might be expected the bright delinquents were significantly more accomplished than their controls; 27 index boys and five controls attained a reading agé above or equivalent to their chronological age ($P<\cdot01$) while two index and 28 controls were four or more years retarded.

School.

There were 31 index and 30 control subjects who had passed school-leaving age of whom 13 and four respectively had stayed on at school for one or more extra years The type of school currently or last attended by the boys is shown in Table 1.

TABLE 1

TYPE OF SCHOOL CURRENTLY OR LAST ATTENDED.

Type of School	Index (N=50)	Control (N=50)
Grammar	9	—
Comprehensive	10	15
Secondary Modern	21	27
Technical College	4	—
Maladjusted Boarding	4	1
Physically Handicapped	1	1
Approved School	1	6

In both series the boys were largely from secondary modern schools. In the index series the mean IQ of the grammar school boys was 130·2 (range 123–139) and of the secondary modern school boys 121·1 (range 115–134; four boys have IQs over 130).

Academic Performance.

Of the bright boys, 32 expressed hopes of taking public examinations in the future; eight had attempted such examinations, all with limited success (four at GCE O-level, two CSE, one RSA, one Junior College Preceptors).

None of the control series had attempted any public examination or expressed any wish to do so.

School Reports on Boys.

These were generally poor for both groups. In both series more than one-third of the boys had failed to attend school on more than 50 per cent of occasions during their last 10 weeks of schooling. 14 index and 17 control subjects were described as abnormally solitary, and a further 21 index and 10 controls were said to seek out trouble-making companions. Only three index and eight control subjects were described as showing satisfactory attitudes towards their teachers.

Boys' Self-Reported Attitudes to School.

In both series, many boys expressed a strong dislike (19 index and 19 controls) or feelings of indifference towards their schools. This antipathy was felt more towards their school work than towards their teachers or fellow pupils. 42 index subjects and 38 controls reported persistent difficulty in concentrating on their work. Although receiving unfavourable reports from their teachers, the boys themselves reported generally favourable attitudes towards their teachers—as many as 26 bright and 19 average boys describing their teachers as likeable.

Enquiry was made as to the boys' special difficulties in individual subjects; there was a tendency for the controls to mention more difficulties, the excess being attributable to difficulties in reading and spelling.

Boys' Self Appraisal and Aspirations.

When asked to compare their own intelligence with that of other boys of their age, 23 index boys regarded themselves as above average and only one as below, whilst three controls rated themselves as above average and 10 as below (inter-group difference significant at 0·1 per cent level). Self-ratings by comparison with other members of the family are shown in Table 2.

TABLE 2

BOYS' ASSESSMENT OF THEIR OWN INTELLIGENCE IN COMPARISON WITH THAT OF PARENTS AND SIBLINGS.

	Index (N=50)	Control (N=50)	
(1) Compared with Father			
Self less intelligent	23	36	
Self equally intelligent	12	7	
Self more intelligent	12	4	p<·05
(2) Compared with Mother:			
Self less intelligent	16	33	
Self equally intelligent	11	9	
Self more intelligent	19	6	p<·01
(3) Compared with Siblings:			
Self less intelligent	19	24	
Self equally intelligent	16	19	
Self more intelligent	12	7	NS

Testing the whole distribution, there is a significant difference in the way the two groups compare themselves with their parents, the index group rating themselves more highly than the controls. The boys' job aspirations, considered in relation to their IQ, were rated by two independent assessors. 26 boys in the index series were judged to have aspirations grossly below their potential. Few bright boys believed their parents took any interest in their schooling (19) or their job aspirations (27).

IV.—DISCUSSION.

The present study indicated that bright delinquents are relatively rare in the Remand Home setting. Whereas the consecutive series of 50 boys of IQ115+ comprised 7·8 per cent of all those tested, it would be expected on the basis of a normal distribution of intelligence that approximately 16·5 per cent of the general population would attain a score of 115+.

Educational retardation is generally reported to be characteristic of delinquent boys, and in particular poor reading ability has been emphasised, e.g., by Eilenberg (1961) and Glueck and Glueck (1934).

Whilst the present study suggests that bright delinquents read fairly well, the results indicate a serious degree of overall educational underfunctioning. For example, it seems reasonable to suppose that the 21 bright boys from secondary modern schools were misplaced in terms of their intellectual ability although, perhaps, correctly placed in terms of educational performance. Along with this, these gifted boys resembled delinquents in general in their hostility towards school and particularly school work; in this respect they differed from the gifted non-delinquents studied by Shields (1968) in Yorkshire.

Despite their low scholastic achievement, many in the high IQ group seemed to be aware of their intellectual superiority, rating themselves as of above average intelligence and entertaining hopes of taking public examinations—albeit seldom with any realistic plans.

However, their expressed hopes for future jobs represented a low level of aspiration, in keeping with their established pattern of non-achievement.

What reasons can be put forward for the large proportion of educational casualties amongst this group of potentially able boys? The social findings presented elsewhere (Gath *et al.*, 1970) suggested a number of possible contributory factors both in the immediate family environment and in the broader social setting. For example, many boys were from broken homes or had parents receiving psychiatric treatment; many had friends who had been through the courts.

The psychiatric findings may also be relevant; a large proportion of the bright boys were found to be severely psychiatrically disturbed and this in itself may contribute to both delinquency and educational failure.

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SUMMARIES OF RESEARCHES REPORTED IN DEGREE THESES

A STUDY OF THE B.Ed. STUDENT

By R. GALLOP

(*Abstract of thesis submitted for the degree of M.Sc.* (*Education*) *of the University of Bradford*, 1969)

I.—Aim.

This investigation was undertaken to examine some aspects of the B.Ed. student in relation to the structure of the B.Ed. degree in general, and to the Certificate student in particular.

II.—Sample.

Samples of 50 B.Ed. and 50 Certificate students, matched for sex, subject interest and year of college course, were selected by use of a table of random numbers and the college admissions register from two colleges within the Southampton ATO.

III.—Measures.

In all, six areas were investigated—educational opinions (Oliver and Butcher's 'Survey of Educational Opinions'), value systems (A–V–L Study of Values), personality (Cattell's 16 PF), intellectual capacity (AH5), professional motivation and achievement motivation (for which questionnaires designed specifically for the investigation were used).

IV.—Conclusions.

(1) B.Ed. men are more theoretically minded than Certificate men ($p < \cdot 05$); B.Ed. women are more politically minded than Certificate women ($p < \cdot 05$).

(2) B.Ed. students are more concerned with continuing their own education than Certificate students ($p < \cdot 01$), and attach greater importance to having a personal interest in a special subject ($p < \cdot 01$). B.Ed. students are less concerned with job security than Certificate students ($p < \cdot 001$), and less apprehensive of failure ($p < \cdot 01$).

(3) B.Ed. men are more likely than Certificate men to delay deciding to teach till after leaving school ($p < \cdot 05$). No such trend is revealed for women. B.Ed. students (particularly women) are more orientated to secondary teaching ($p < \cdot 05$) than Certificate students, and are also more likely to have experienced a grammar school education ($p < \cdot 05$). This fact is reflected in GCE A-level achievements, B.Ed. students having more A-level passes than Certificate students ($p < \cdot 05$).

(4) Certificate students score lower on average than B.Ed. students on part A of AH5 ($p < \cdot 001$). When the performance of Southampton ATO B.Ed. students on AH5 is compared with the norms for university students quoted in the manual, both male and female B.Ed. students score significantly lower ($p < \cdot 01$) than their university counterparts. In this ATO, B.Ed. selection depends upon interview performance and first-year college record rather than on the possession of university entrance requirements.

(5) 16 PF analysis indicates that B.Ed. students deviate from average on more factors (Q_1 for men and M and G for women) than Certificate students, suggesting that B.Ed. men are more radical and free thinking, while B.Ed. women tend to be more imaginative and creative, though less conscientious and persistent, than Certificate women.

(*Manuscript received 29th December*, 1969)

A STUDY OF THE HARRIS REVISION OF THE GOODENOUGH DRAW-A-MAN TEST.

By M. SINHA

(*Abstract of a thesis submitted for the degree of Ph.D., University of London,* 1969)

I.—Aim.

An analysis of the performance of children aged 7 to 11 on the Draw-a-Man Test aimed to study the comparability of British children's scores with American norms for these ages, and the reliability and validity of the Harris revision of the test.

II.—Tests and sample.

506 children (254 boys, 252 girls) in seven London schools were tested on two forms of the Harris Test, Draw-a-Man and Draw-a-Woman (two markers assessing the drawings independently). Tests of intelligence (NFER Non-verbal 5, Primary Verbal 1 and 2, Deeside Picture Test) and school attainment (NFER Sentence Reading, Staffordshire Arithmetic, Schonell's Spelling Tests A and B) were applied to groups according to age.

III.—Results.

Mean scores in this sample were higher than the norms for the corresponding groups in the American standardisation, particularly for the 7 and 8-year-olds: e.g., at age 7, on Draw-a-Man, mean scores in the sample were, for boys, 28·00, girls 33·00 (American norms 21·60, 24·30, respectively); and on Draw-a-Woman, boys 27·05, girls 35·9 (American norms 22·90, 28·70). The girls had higher mean scores on some other tests also: e.g., on NFER NV5, at ages 8, 9 and 10 the mean scores of boys were 98·50, 97·50 and 94·44, respectively, while the mean scores for girls at these ages were 110·40, 102·82 and 91·22.

Test-retest reliabilities were low, ranging from ·57 to ·74 for different sub-groups. In the total sample, reliability for the Man Scale was ·65, and for the Woman Scale ·58. Item-homogeneity by Kuder-Richardson Formula 20 varied between ·84 and ·90. Independent assessment of the drawings by two scorers resulted in correlations ranging from ·65 to ·88 for separate age-groups. Taking the group as a whole, the scorer-reliability of the Man Scale was ·81, and of the Woman Scale was ·98. An item-by-item comparison of the scores allotted to each drawing by the two scorers revealed that they had differed largely on some of the individual items. Instructions for scoring some items were found to be vague and inconsistent; other items were difficult to score because of the manner in which they were drawn; the nature of other items made scoring subjective.

TABLE 1

Correlations of D–A–M and D–A–W with Tests of Intelligence and School Attainment.

Tests	N	Ages	D–A–M Lowest	D–A–M Highest	D–A–W Lowest	D–A–W Highest
NFER NV5	194	8–10	·24	·49	·12	·45
Primary Verbal 1	69	8–9	·13	·29	·12	·59
Primary Verbal 2	108	9–10	·04	·52	·07	·54
Deeside Picture Test	64	7–8	·38	·70	·25	·64
NFER Sent. Reading	243	7–10	—·03	·46	·03	·61
Staff. Arithmetic..........	185	7–9	—·08	·61	—·05	·53
Schonell's Spelling A	94	8–9	—·19	·31	·00	·33
Schonell's Spelling B	94	8–9	—·15	·34	·03	·23

Correlations of the Harris Test with the tests of intelligence, and with tests of school attainment were below the ·05 significance level in 44 out of 80 sub-groups. The range of correlation coefficients is given in Table 1. More than half the items of the two scales did not show a consistent increase in the percentages of children passing with increase in age. Correlations between the orders of difficulty of items in the standardisation data and in the present data ranged from ·87 to ·94.

Factorial analysis of items by weighted summation method using varimax rotation, revealed a general factor (contributing 30 and 20 per cent to the total variance of the Man and Woman scales, respectively) and four other factors which differed for boys and girls, and for the two scales. An analysis of the results suggested among boys a greater concern for proportion, and among girls a greater concern for details.

(*Manuscript received 22nd December*, 1969)

TESTING LISTENING COMPREHENSION OF FRENCH IN SECONDARY SCHOOLS

By A. P. DYSON

(*Abstract of a thesis submitted for the degree of M.Ed., University of Manchester*, 1969)

I.—Aim.

To construct three different tests of listening comprehension in French and administer them, with a view to assessing their suitability for use in public examinations such as GCE O-level or CSE, considering their reliability, validity, relative ease of construction and administration and feedback effect on teaching.

II.—Procedure.

Three types of test, all objective, were designed for the experiment. Type One consisted originally of 40 discrete items and attempted to sample the problems involved in listening comprehension separately at the phonological, lexical and structural levels. However, items devised to test phonetic discrimination proved unsatisfactory and the section designed to test this skill was omitted from the final version of the test, which now consisted of 30 items (four choices per item). Form A of the test lasted 25 minutes, Form B 28 minutes. No reading of French was involved.

Type Two consisted of 20 items (three choices per item) and was based on a passage of French read out to the candidates twice in each test and lasting two minutes in each case. Total time for administration of each form of the test was 20 minutes. Some reading of French was involved.

Type Three consisted of 30 discrete items (four choices per item) and tested the integrated skills. The test lasted 21 minutes: only one form was constructed. A considerable amount of printed French had to be read by candidates in selecting responses.

After a try-out and item analysis the tests were administered to a sample of fourth and fifth-year secondary-school pupils, consisting of boys and girls in almost equal numbers from one comprehensive, one grammar-technical, one modern, one technical high and four grammar schools. Numbers completing the tests varied because of absences and are indicated in the tables. The scores of each candidate on the two administrations of each test were correlated to give a measure of reliability. Total scores for each candidate on both administrations of each test were correlated to give a measure of validity.

III.—RESULTS AND CONCLUSIONS.

Table 1 suggests that Tests One and Three are more reliable than Test Two. A test-retest coefficient of reliability, as for Test Three, tends to be higher than an equivalent-forms coefficient, as for Test One. Coefficients of reliability by application of Kuder-Richardson Formula 20 to data from the first administration of the tests also showed Test One Form A ($r_{KR} = 0{\cdot}777$), and Test Three ($r_{KR} = 0{\cdot}741$), to be more reliable than Test Two, Form A ($r_{KR} = 0{\cdot}538$). The same formula applied to data from the try-out of Test Two, Forms A and B, which were modified only slightly for the final versions, showed that Form A ($r_{KR} = 0{\cdot}520$) was slightly less reliable than Form B ($r_{KR} = 0{\cdot}627$) (N=143). Both forms of Test Two were less reliable than the other tests, even allowing for the fact that this test contained fewer items than the others.

TABLE 1

CORRELATIONS OF CANDIDATES' SCORES ON THE TWO ADMINISTRATIONS OF THE TESTS.

	Mean	SD	No. of Items	N	
Test One, Form A	17·42	5·39	30	244	$r_{ab}=0{\cdot}722$
B	15·42	5·16			
Test Two, Form A	17·00	4·96	20 (weighted 1·5)	241	$r_{ab}=0{\cdot}484$
B	19·81	5·27			
Test Three, 1st admin.	13·23	4·68	30	210	$r_{II}=0{\cdot}768$
2nd admin.	15·39	5·14			

TABLE 2

CORRELATIONS OF CANDIDATES' TOTAL SCORES ON BOTH ADMINISTRATIONS OF EACH TEST.

Test One with Test Two	r=0·704	(N=225)
Test One with Test Three	r=0·782	(N=189)
Test Two with Test Three	r=0·662	(N=192)

Table 2 suggests that if we accept performance on the series of tests as a criterion of validity, Test One is marginally more valid than Test Three and that both these tests are more valid than Test Two.

Tests One and Three were considerably more difficult to construct than Test Two. Test Two, however, had the disadvantage that the number of items which could be based on a single continuous passage of reasonable length was limited. (The passages used for Test Two Forms A and B had been subjected to the judgment of a CSE Subject panel). It was also difficult to modify items which proved to be unsuitable in the item analysis. None of the tests proved difficult to administer. The form of Test One appeared to present language in a less natural context than Test Three. Test Two seemed the closest approximation to a good classroom exercise. From the statistical point of view, Test One may be marginally superior to Test Three. The reliability of both these tests seems fairly satisfactory, given that coefficients of reliability tend to be lower for tests of the oral-aural skills than for written tests.

In view of the ease of construction of Test Two and of the fact that it presents language in a more natural context than the other tests, it would seem desirable to attempt to determine why Test Two proved less reliable. Possibly by the use of a number of shorter, varied passages or by a modified response technique, the reliability of the test could be raised to an acceptable level.

(*Manuscript received* 14*th January*, 1970)

BOOK REVIEWS

BEARD, RUTH M., HEALEY, F. G., and HOLLOWAY, P. J. (1968). *Objectives in Higher Education.* London : Society for Research into Higher Education, pp. 75, 18s.

This book, the first of a series on higher education which a working party of the SRHE intends to produce, has the faults and the merits of teamwork. It may lack unity, but it is rich in material, both practical and theoretical.

The message of Chapter 1, by Dr. Beard, is that the identification of objectives in higher education is now an urgent necessity. Innovations are already upon us. Only if clear objectives are consciously pursued will these innovations lead to genuine advance. The urgency of the situation has been sharpened by the recent invasion of the educational field by the cost-effectiveness investigators. If we do not have our objectives in good shape we may find good things disappearing (even so apparently axiomatic a desideratum as freedom to criticise) and outmoded things continuing.

Chapter 2, by Drs. Healey and Holloway, examines what it calls the ' classical objectives ' of university teaching, especially the long co-existence of the Newman concept of liberal education and the utilitarian idea of directly serviceable training. " On the whole, Newman's view seems to have held sway up to the present day in all *discussions* about university education, but it is the utilitarian one which has been used as a basis for *action* . . . " The authors try to bring these attitudes into the orbit of modern talk about objectives by showing that in both cases a ' behavioural change in the learner ' is sought.

This leads into Chapters 3 and 4, by Dr. Beard, which deal respectively with the methods of defining objectives (with special reference to Bloom) and with the principles and techniques of evaluation. Illustrative examples are drawn from the field of higher education.

The book as a whole is of great value, but more as a set of concentrated notes than as a unified creation. The authors are absolutely right in claiming that the definition of objectives in higher education is a priority task and those who are now attempting the task will find that much spade work has been done by this working party. The text as it stands moves rather jerkily from one topic to another and the selection of topics is sometimes rather arbitrary. The second chapter is the ' smoothest,' but the others provide more direct help to researchers.

The book has laid good foundations and its successors in the series will no doubt continue to do so. It remains for a modern Newman to erect a superstructure.

STANLEY NISBET.

BERNARD, H. W., and FULLMER, D. W. (1969). *Principles of Guidance : a Basic Text.* New York : International Text Book Company, pp. 399, n.p.

The scope of this book is potentially of unusual interest and importance. Much of its content is concerned with changes in orientation in American guidance and counselling, of which a number of people concerned with guidance in this country do not yet seem to be aware. Briefly, this is to see the counsellor not as a psychotherapist spending most of his time interviewing individual students on a non-directive basis, but as an indispensable school-based person who would necessarily be involved with a much greater number of people and tasks, ranging through individual and group counselling to acting as a catalyst in the school.

The nature of the task undertaken by the authors is truly enormous in scope and complexity ; so it is not surprising if at times it is not always easy to follow the logic of the general framework which the authors have constructed to encompass the ideas and material they present. A major premise is that the guidance worker's role is significantly determined not by policy or tradition but by knowledge or personality, the scope and quality of these last named representing the difference between the professional and the technician. In Part I the authors attempt to assemble those findings from the social and other sciences which the school counsellor must understand if his work is to have professional meaning. This section is composed of a series of chapters covering a range of such areas, each necessarily in a very concentrated, summary form: The Nature of Man in a Democracy; Urban Culture and Personality; Technological Revolution: Changing Nature of Work; The School as a Social-Cultural Institution; The Family: Peer Groups—Self and Identity.

Part II deals with the different functions of teachers and counsellors, the place of the counsellor in the administrative hierarchy, the programme of guidance and counselling, including community involvement, and the responsibility of a guidance counsellor in this and in other parts of the school's activities, such as curriculum development. In Part III a series of chapters is devoted to the major functions of the guidance counsellor, with a final chapter on the preparation of the counsellor for the expanded and enormously exacting and professional role which the earlier chapters have described and emphasised.

This brief outline of the book, like the authors' own framework and chapter headings, does little to convey the urgency and importance of those needs of children and young people in contemporary society which lead the authors to insist that the school requires a counsellor who can act both as consultant to teachers, parents and administrators as well as pupils, and as a significant agent of change in altering and enhancing learning climates in the school. In detailed discussion the authors put forward a number of views which are not only exciting and stimulating but appear to be very appropriate to the future development of the school counselling movement in this country as well as in the United States It was with considerable disappointment, therefore, that the reviewer found this book, on the whole, badly written and poorly presented.

The data, ideas, arguments, references are packed tightly together in a confused jumble. The sequence of ideas is frequently haphazard and without direction. Even statements beginning with a phrase such as "In brief . . ." may have no relation to what preceded it. Occasionally paragraphs begin and end at unexpected places. Summaries of chapters may omit important points or incorporate ideas not mentioned. In most cases, in fact, they are really not summaries. A lengthy chapter could be written on the deficiencies of one chapter alone, Chapter 10, which is the most carelessly presented chapter this reviewer has ever encountered in a publication. Linked with difficulties of this kind is an impoverished use of language. Very many sentences are, like the following example, crude and ugly as well as relatively meaningless: "There are formidable forces at work in the culture to equalise the perceptions based in parameters either imposed or consensed" (p. 125). Some statements also put forward as representing conclusions reached by scientific investigations in the field of human behaviour read like over-generalised interpretations, more calculated to damage the image of psychology as a science than to provide support for the position adopted by the authors.

This book seeks to present and explore a newly developing approach to guidance and to the school counsellor which those concerned with guidance in this country would do well to understand. It is marred, however, by pervasive defects in expression and presentation which reduce its chances of being taken seriously by intelligent readers and which do no service to the position adopted by the authors. That Bernard and Fullmer have the capacity to write well is clear both from Chapter 12 (the only properly presented and well-written chapter in the book) and from their 1964 book on counselling. In this reviewer's opinion this present book is essentially a very promising and important manuscript which should not have been published in book form without careful revision. PATRICK HUGHES.

BOWLBY, J. (1969). *Attachment and Loss*: Vol. I. *Attachment*. London: The Hogarth Press and the Institute of Psycho-Analysis, pp. xx+428, 63s. (International Psycho-Analytical Library. Edited by M. Masud R. Khan, No. 79.)

A recent memorandum from the Royal Society of London drew attention to the trends and advantages in the latter part of the twentieth century for the interpenetration of the techniques and conceptual structure of each scientific discipline by those of others. This has happened particularly in the biological sciences where the traditional boundaries on university curricula between zoology, psychology, chemistry, genetics, physics, botany and mathematics are now less defensible.

In an analogous way, it has become increasingly evident over the last two decades that within the terms of reference of psychology, a number of strands of enquiry have begun to enmesh, enrich and support each other. From Darwin, through Galton and McDougall came the strong emphasis upon selection and some form of evolutionary continuity between animals and man. In *The Descent of Man* and *The Expression of Emotions in Animals and Men*, Darwin clearly showed that his interest in continuity extended beyond the evolution of bodily structure to patterns of behaviour. Similarly, issues akin to the behavioural homologies suggested by McDougall's instincts, each with a ' neurological correlate,' which had no more than hypothetical status at the time of his death in 1938, have now gained support from the neurological researches of Hess and Brügger and von Holst and Ursula von St. Paul. Freud, who more than once regretted the lack of " a securely founded theory of instincts on which it might be possible to build further " . . . and that " psycho-analysis is driven to make tentative efforts towards some such theory," nevertheless emphasised the enormous strength of the instinctive urges of sex, fear and aggression and particularly stressed the importance of early attachment in their direction and control throughout life.

Many revealing empirical studies in comparative social psychology and social anthropology were not available to Freud at the time when he wrote his most important works, nor were many of Piaget's studies of cognitive development and the behaviourists' extensions into operant conditioning and secondary drives, although Freud in his *Project for a Scientific Psychology*, first available to most students in 1954 with the publication of *The Origins of Psycho-Analysis* by the Imago Press, clearly showed that he was aware of the ramifications of ' feed-back ' and control systems in behaviour. Now, along with the early systematic studies of delinquency by Burt, Healy and Bronner and the Gluecks, can be reviewed the empirical literature on sensory deprivation, maternal deprivation, war separation, hospitalisation of children, attachment in animals, the social dynamics of *animal* communities and the detailed studies of homologous patterns of behaviour deriving from the early insights of Spalding, Heinroth, Whitman, Wallace Craig and, more recently, Lorenz, Tinbergen and the larger number of workers inspired by them. To write responsibly, at the present time, on the topic of emotional attachments, is a very complex task.

The present work, *Attachment and Loss*, falls into four main parts: the definition of the task, Instinctive Behaviour, Attachment Behaviour, and the Ontogeny of Human Attachment. There is an interesting appendix which reviews the psychoanalytic literature on the child's tie to the mother. The second volume is to deal with problems of separation, anxiety, grief and mourning, deriving from papers in these fields published by the author in the early 1960s.

It will be apparent that the author has undertaken a task of unusual difficulty, of the first order of importance and topicality and one with which at least five major literatures have been associated, namely, ethology, anthropology, psychoanalysis, educational psychology and learning theory. All the basic logical problems of the explanation of behaviour are involved and there is the recurrent issue of whether or not a behavioural manifestation reported in an ethological study adds some intrinsically new, empirical element to the explanation or is but the outward expression of an emotional condition, covered by some concept from psychoanalytical literature. The essential task is to combine the insights and findings of the different fields in the optimum way defensible at this point in time. Determinations of relevance and timing in presentation are clearly daunting, but the impression arises that a clearer account of the impingement and mutual reinforcement of the several disciplines might have been achieved if attempted within a reduced space. Ideally, perhaps, the basic problems of explanation should first be argued to a succinct and defensible position and then the empirical data arranged, as relevant, to this pattern. It is by any method a difficult task since, as in many clinical problems, one needs to be aware simultaneously of several facets or contributing factors. Much relevant data and many insightful observations are available, yet the impression arises that the impact of this useful work would be enhanced by more succinct presentations. F. V. SMITH.

ESCALONA, S. K. (1969). *The Roots of Individuality: Normal Patterns of Development in Infancy.* London : Tavistock Publications, pp. 547, 100s.

Escalona describes in this volume a further analysis of part of the data arising from the experiment reported in the monograph *Early Phases of Personality Development* by Escalona, Leitch *et al.*, 1953. The main concern of the present work is (1) to identify differences in the behaviour and reaction tendencies of infants up to the age of eight months ; (2) to study the genesis of these differences ; and (3) to establish whether behaviourally manifested differences in early life *make a difference*, i.e., whether they may account in part for observable differences in the rate and course of development and differences in adaptive style or personality functioning at later stages. The consequences of high and low activity level are examined and a construct of behaviour-in-context, referred to as ' stable patterns of experience,' is explored for its predictive power for the course of development.

The work is in three parts : Part 1 describes the data and methods of analysis and discusses the theoretical framework ; Part 2 reports the comparative study of high and low activity level subjects ; Part 3 is a complete set of case studies of the 32 infants on which the book is based. The entire study is a retrospective examination of the records of these 32 children, selected to contrast activity level at each month of age from 4 to 32 weeks, and grouped into three age levels. The records were drawn from those of the 128 normal infants who formed the sample in the 1947-51 enquiry.

Chapters 1, 3 and 9 offer interesting discussions of developmental theory and, although the author explicitly denies having generated any novel theory of development, her admitted borrowing from, and adaptation of, convenient theories (in particular from Kurt Lewin) represent at least an idiosyncratic viewpoint and methodology. She claims a psycho-analytic orientation and a compatability of her developmental standpoint with that of Piaget. She also evinces a preference for behavioural operationalism, a distrust of hypothetical constructs and an explicit avoidance of statistical tests of significance. The whole of the work described is a laborious inductive operation in which promising hypotheses are sought. Despite a perhaps over-full account of data and methods, the reader is left in a certain amount of confusion, in which the extent of the actual independence of the data classified and compared in different ways is uncertain. The same is true of the conclusions, which after all the qualifications have been taken into account seem to offer very little for the pages of analysis that preceded them. M. A. BRIMER.

EVANS, E. G. S. (1969). *Modern Educational Psychology. An Historical Introduction.* London : Routledge and Kegan Paul, pp. 110, £0.90.

This short history touches upon the evolution of ideas in four areas : child development, personality theory, learning theory and psychometrics. The account is generally reliable, barely representative and rather dull. It reads, perhaps intentionally, like a set of brief lecture notes and inevitably the action jerks along from one set piece to another. Dr. Evans has apparently been allowed little space in which to go beyond the bare outline of his history and, in spite of the publisher's claim that " the book provides a valuable introduction to educational psychology," it is an introduction to a view of educational psychology that is itself becoming part of history. It provides, for example, few historical insights to support the student working through the Lunzer and Morris trilogy as a set text. Viewed against this context Dr. Evans' conclusion that " the growth of the child guidance movement . . . constitutes one of the most significant features of modern child psychology," whilst debatable, is magnificently irrelevant.

At a more concrete level, the same pressures for condensation and succinctness have led to such infelicities as Watson 'inventing' behaviourism, the complete omission of Skinner and no reference to Boring in a list of psychological history texts. On the whole, the references to particular theorists and experiments are reliable but to imply that the simultaneous presentation of C.S. and U.S. is a typical experiment from Pavlov's laboratory is wrong and misleading. All told, students would be better advised to buy Thompson's Pelican history at less than half the price of this volume. A. L. WILKES.

FRAISSE, P., and PIAGET, J. (Eds.) (1969). *Experimental Psychology: Its Scope and Method.* Vol. VII, *Intelligence.* London: Routledge and Kegan Paul, pp. 283, 35s.

This book, the seventh volume of a nine-volume set, is concerned with intelligence; it is the work of four psychologists who write from the standpoint that thinking is an intellectual *activity* and depends on structures. Of the four chapters in the book the first is written by Oleron, the second and the third are the joint efforts of Piaget and Inhelder, and the fourth is the work of Greco.

Oleron writes on intellectual activities. He concentrates on the aspect of a psychologists' ability " to establish a correspondence between notions and objectively observable behaviour and to determine what are the conditions upon which he can show this behaviour to depend " (p. 2). There are good summaries and comments on experiments which deal with inductive thinking, reasoning and problem-solving. The conditions which may influence these activities are emphasised.

There is a stimulating chapter by Piaget and Inhelder on mental images. The evolution and roles of motor, reproductive and anticipatory images are discussed and attention is paid to the different relations between images and operational thinking. This chapter seeks to raise questions rather than answer them (note the conclusions pp. 139-141). Piaget and Inhelder's chapter on intellectual operations gives a good justification of their search for such operations and their integrated structures. They give summaries of their genetic studies in, for example, conservation, number, chance and formal operations. These summaries, supplemented by results and discussion of similar work by others, give a clear account of Piaget's views and some of his evidence.

Greco gives a thought-provoking discussion on learning and intellectual structures. By his consideration of, for instance, animal learning, certain models, Hull's experiment on Chinese characters and Smedlund's experiments on conservation and transitivity, he shows the importance of an experimenter's assumptions and their influence on the interpretation of experiments. He points out the need to choose carefully the activities through which intellectual structures are expressed. Greco's conclusion is to accept Piaget's view of structural learning, which consists of the modification and elaboration of incomplete schemata.

It may be a disadvantage that the book was first written in 1963. While insufficient attention is paid to experimental design and to creativity the book will repay careful study. J. REYNOLDS.

HOPSON, B., and HAYES, J. (Eds.) (1968). *The Theory and Practice of Vocational Guidance: A Selection of Readings.* Oxford: Pergamon Press, pp. xiii+523 105s.

The two editors, members of the Vocational Guidance Research Unit at the University of Leeds, having recognised the difficulty of access to articles (particulary American ones) that are basic to the theory and practice of vocational guidance have produced this volume for " students, teachers and practitioners in the field " who would encounter this problem.

There are 36 articles, edited monographs or contributions to reviews of relevant areas, two-thirds of them published since 1963, and 11 of them written by British workers. In the part labelled 'Theory' there are four sections: Theories of Vocational Choice; The Home and the School; The Transition from School to Work; and The Work Experience, and under the head of 'Practice' are another four sections, on The Aims of Guidance; Guidance in Practice; Occupational Information; and The Use of Tests in Vocational Guidance.

Cherns (*Br. J. Soc. Clin. Psychol.*, 7, p. 318) states the criteria he uses when reviewing a set of readings. He feels that (*a*) the articles should be important and difficult to obtain, (*b*) the editorial material should provide a new setting for the articles so that they may yield fresh interpretation, and (*c*) the selection should give adequate and complete coverage of the most important articles in the field. These seem criteria against which this book may usefully be judged.

The articles are important, either as seminal contributions to theorising, as reviews of theory or practice, or as conceptual analyses. As to availability, some of the British articles appeared originally in *Occupational Psychology* and are perhaps fairly accessible, while a few of the American ones (on theories of vocational development) are included in Peters and Hansen: *Vocational Guidance and Career Development—Selected Readings.* These apart, the articles and monographs printed would, this reviewer judges, be difficult to obtain, especially if one were a student working against the deadlines of end-of-course examinations; and the total compilation allows easy and therefore encouraging access to relevant material.

The second criterion, of the extent and quality of the editorial material, is fully relevant only to readings on an area of research and not directly to this book. The editors' aim is to serve those pursuing self-development or some course of training. In their introduction to the two parts and to sections they set out very clearly for the incoming student the overall scene and the relevance to it of each section. The additional references and suggested further reading with which they end each section is particularly useful, making this a very practical book for anyone entering the field. Perhaps the only flaw is that while the author index is adequate, the subject index is disappointingly thin.

Lastly, the articles selected do give adequate if not complete coverage of the most important in the field. The virtue of this compilation is the concentration of the editors on articles that (*a*) were published within the last six years, and (*b*) tended to be those delineating concepts and reviewing relevant studies.

This is a stimulating book to work through and of prime value to undergraduate students in psychology who are working on vocational guidance as a special subject, to post-graduate students starting in occupational psychology and to those qualifying as school counsellors. T. E. CARRUTHERS.

INGENKAMP, K. (Ed.) (1969). *Developments in Educational Testing.* London: University of London Press, 2 Vols, pp. 446 and 502, 130s. each.

A distinguished selection of 51 speakers from 25 countries was invited to an international conference on educational testing in Berlin in 1966. The prepared papers for the conference, 79 in all, are now published in English in two excellently produced volumes. There are few conferences where the quality of the contributions justifies publication of the papers in full, but this is clearly an exception. The papers constitute a unique reference text which reviews testing practices and problems on a world scale.

The first 200 pages of Volume I report the position of educational testing in USA, France, Czechoslovakia, Sweden, Germany, Britain, Belgium, Switzerland, West Africa, Chile, Argentine, West Indies, Japan, South-East Asia, Pakistan, Iran, Israel and Australia. National test procedures are described in detail and addresses of test agencies are given, with discussion of educational issues involved. Of particular interest are the 13-page outline of American test programmes (CEEB, Graduate Record Examinations, Project Talent, and so on) and the account of testing in Japan. We have too readily assumed that English-speaking nations have a monopoly of test expertise.

The remainder of Volume I consists of three papers on objectives in testing, ten on new approaches to testing and five on technical aspects of test construction. The discussion of new approaches is of special interest here, and includes useful reviews of research, for example, by Messick on cognitive styles and by Kogan on multiple-choice as a measure of decision-making and risk-taking.

The first 24 papers in Volume II also have a unifying theme, the practical uses of tests in education : five papers on the pre-school or school entry stage ; ten papers on selection and prediction (in France, Britain, Belgium, Holland, Israel, Central Africa, Mali, Kenya, Pakistan and Canada) ; and nine papers on higher education. This last group includes an appraisal of the CEEB programme, the British Scholastic Aptitude Test project, selection problems in Japan, Canada and Chile, and special examining problems in developing countries, in Germany and in Ethopia (where there are " at least 45 identifiably different languages ").

The balance of Volume II is made up by three papers on the influence of tests on learning,three on teachers' attitudes to testing, three on the interpretation of test results and six on the use of tests in curriculum development and programmed learning, together with two statistical papers. A six-page appendix to one of the chapters outlines the mechanics of item writing.

The price and scope will restrict purchase by individuals, for different parts will interest different readers. But the two volumes deserve a place in the reference library of every university and college which offers courses on educational measurement. As a mine of factual information, unavailable elsewhere, the publication will date, though not as quickly as may be thought. For though educational testing, narrowly interpreted, is somewhat out of fashion, the approach to the topic adopted here shows how research on measurement leads naturally into the study of general educational and psychological issues. JOHN NISBET.

KAHN, J. H., and NURSTEN, J. (1968). *Unwillingly to School*, 2nd edit. Oxford : Pergamon Press, pp. xix+279, cloth 35s., soft 25s.

TYERMAN, M. J. (1968). *Truancy*. London : University of London Press, pp. 128, 25s.

Unwillingly to School, subtitled *School Phobia or School Refusal—A Medico-Social Problem*, is a second edition of the publication of 1964. The major changes in the new edition are the inclusion of a most comprehensive bibliography of books, theses and articles (pp. 231-271), and of a fourth part in which alternatives to treatment by the traditional child guidance clinic team are discussed in short sections ; these include the roles of paediatrician, general practitioner, education welfare officer, educational psychologist in the school psychological service and school teacher. The book covers much more ground than the topic indicated in its title. It is one of the best accounts we have of the principles and practices of the interdisciplinary child guidance team, by two of its most distinguished practitioners, a psychiatrist and a psychiatric social worker. Thirteen detailed case studies illustrate the text.

Dr. Tyerman, who has worked as an educational psychologist for many years in South Wales and Lincolnshire, has based his book on a thesis for a higher degree at London University. Volume 28 of this journal included an article on his research into truancy. In the first stage of this research he examined some sociological and educational characteristics of a large number of school absentees. This was followed by a more intensive assessment of 40 selected cases of persistent truanting. The third stage consisted of systematic comparisons between the truanting and a non-truanting group matched for age and sex on a number of social and psychological variables. The latter group was a sample drawn from children attending child guidance clinics ; such comparisons, though certainly of interest, leave one uncertain of the deviance of the samples under study compared with the normal population.

From the early 1930s a considerable volume of literature has shown a preoccupation with the taxonomic problem. Terminology is still confusing : some writers, including Tyerman, employ the term ' truant ' to all cases of unlawful absence from school. Others such as Clyne, whose interesting book, *Absent*, was reviewed in this journal in June, 1967, apply the term ' school refusal ' to children who, with their parents' knowledge, resist leaving their homes and going to school The term ' school phobia,' used by many, is justly criticised because, used indiscriminately, it debases the concept of a phobic condition. In addition to the behaviours which these terms attempt to distinguish, there is the relatively more common occurrence of children being kept at home by parents who do not value education, to which the term ' school withdrawal ' has been applied. The validity of these distinctions is beyond question, and is supported by a mass of clinical experience as well as systematic studies. Whatever the difficulties in developing a classification, the basic psychiatric dichotomy of ' discontinuous ' and ' continuous ' symptoms seems to be a good starting point in this problem, as in other forms of childhood maladjustment that have superficially similar features but very different origins and prognoses.

Although his book contains much that is of interest, including practical recommendations for prevention and early detection, it is difficult to see what Tyerman's work adds to existing knowledge of the problems. Many distinctive syndromes, showing the common feature of absence from school, are described, but the distinctions are not observed in his field study. His main conclusion is that ' truanting,' which is a much larger problem than ' school phobia,' should be the object of psychological investigation and informed intervention.

Kahn and Nursten recognise that there are many different levels at which aetiology may be investigated, and that members of interdisciplinary teams may have preferences among these levels of explanation, but that in practice a strategy has to be worked out for each individual case. This very catholic position could be contrasted with Clyne's conclusion that school refusal is " an illness of the child's relationship function, characterised by an ambivalence due to a lack of fusing of hostile and loving feelings."

Much research has been devoted to identification of the social and psychological characteristics of these groups, and some studies, such as Hersov's (1960), have reported significant differences in predicted directions. This type of enquiry, which is analogous to the search for medical syndromes, has shortcomings of clinical and of more fundamental importance. Knowledge of the fact that school-refusers and school-phobics tend to come from a higher socio-economic level than truanting children may lead to misinterpretation of the dynamics of the case of a truanting working-class child and to a mistaken preference for social rather than psychological action in such a case. This is, in part, Dr. Tyerman's thesis.

Another instance of the misuse of generalisations about groups is the criterion of parents' knowledge of a child's absence from school : a ' good ' item in statistical analysis of data from samples of cases which should not be used in making initial decisions for individual cases. The more fundamental problem concerns the nature of psychological investigation of complex, social behaviour. Repeated ' unlawful ' failures to attend school form a sequence of learning experiences with attendant reinforcing states, which change in time with successive exposures. What happens to ' the plans and structure of behaviour,' and what are the outcomes for psychic defences and self-concepts, may be questions for research of far greater psychological interest than the search for types and traits.

Illustrative case studies in both the works under review give support to this belief, but for the most part the works themselves belong to the traditional type of enquiry in this field.

C. J. Phillips.

KALUGER, G., and UNKOVIC, C. M. (1969). *Psychology and Sociology*. St. Louis : The C.V. Mosby Company. Distributed in Great Britain by Henry Kimpton, London, pp. ix+404, 86s.

The present volume contains an introductory chapter, nine chapters on elementary psychology, mainly as related to personality, six chapters on elementary sociology and a final section consisting of case studies. There is an indication in the preface that the book is intended for use with nurses, and it is written at an introductory level. For anyone intending to take serious interest in either psychology or sociology, the tone of the book is over-simplified. Theoretical positions tend to be summarised without any attempt being made to evaluate their relative importance and often without even critical or appreciative comments. The language is sometimes slipshod, sometimes misleading. For example, ' causes of behaviour ' are said to be ' culturally oriented,' ' individually oriented ' and ' value oriented ' (pp. 18-19). and on p. 137 we find the very confusing statement (of Koffka's theory in *The Growth of the Mind*) that " *This theory has not been validated but it has shown that* early visual experiences and memories are more important than later experiences " (reviewer's italics). The most interesting part of the book is the final section consisting of the case studies.

The book is sub-titled *An Integrated Approach to Understanding Human Behaviour*. Now, it is possible to look at a given body of ' behavioural data ' in terms of a system of psychological concepts *and* in terms of a system of sociological concepts ; it is also reasonable to argue that one cannot use both perspectives at once but must use first one and then the other. In this way, one may bring both perspectives to bear on the same empirical problem—for example, alcoholism or delinquency. It would be perfectly defensible to regard this as ' integration ' in one sense. In another (and more fundamental) sense of ' integration ' the integration of psychology and sociology would require at least some system of common or superordinate concepts, some common theoretical structure. Whether this can be done successfully or whether the two perspectives, psychological and sociological, must remain separate though mutually relevant is a moot point, but is certainly an interesting area to think about. The present book, however, is not concerned at all with integration in this latter sense, and can scarcely be said to be concerned with integration in the former sense either, although perhaps one cannot really expect an elementary text to perform such a function.

In either of our two senses of integration, one really needs to know quite a lot about both psychology and sociology before one can talk meaningfully about integration, and a book which really does *integrate* would have to be at a much more sophisticated level than the present one. There may well be something to be said for having one's introductory psychology and introductory sociology in the same volume, but in this reviewer's opinion, the title of the book, especially with the subtitle it bears, is likely to be misleading, particularly, perhaps, to British readers. At 86s. they will certainly find it an expensive buy. D. GRAHAM.

LYTTON, H., and CROFT, M. (1969). *Guidance and Counselling in British Schools*. London : E. Arnold, Ltd., pp. 112, paper 18s.

This small book is the outcome of the National Conference held at Exeter University in July, 1968. The papers read at this conference for the most part form the basis of the text. As might be expected from a gathering of teachers, counsellors, psychologists and psychiatrists, the views expressed are disparate and no consensus of opinion as to what exactly a counsellor is or what he should do appears. However, this is hardly surprising as there is very little actual research yet produced in this field and the speakers were giving their opinion from their observations of the last few years.

Of the material here presented, the papers given by Robb and Cowie are of interest not only to counsellors but to psychologists and psychiatrists who are working in conjunction with schools in whatsoever capacity, while the paper by Lytton rightly calls attention to the American influence and maintains that the English situation is different. There does appear to be some confusion, however, as to what an English school counsellor should do, apart from not modelling himself on his American counterpart. A paper by Kline is disappointing only in its brevity. In its few pages many interesting points in relation to counselling, mental health, the position of the head teacher and pastoral care in general, are given with considerable acuity and argued with clarity and reasonableness.

Although there is very little English research at hand to indicate whether the opinions expressed are merely opinion, the papers are to this extent useful, that they give rise to thought and delineate the areas requiring research. The book is therefore worth recommending to interested teachers, social workers and laymen.

UNA MAGUIRE.

McLEISH, J. (1969). *Teachers' Attitudes: A Study of National and Other Differences*. Cambridge; Institute of Education, 15s.

There are few cross-national studies of the characteristics of teachers and although we can expect differences associated with diverse social backgrounds and professional experiences little is known about the form they take, how far they are national or professional group variations, or to what extent they represent significant ideological or more specific contrasts.

Dr. McLeish's investigation is a bold attempt to provide some provisional answers to our questions. It is based upon teachers from the USA, the Commonwealth, England and Scotland, and covers categories of students in training, teachers from primary and secondary schools, and education tutors—although, for various reasons, comparable professional categories are not always available across the countries. The subjects were assessed on 30 opinion/trait variables and it is a particular merit of the study that it ranges beyond specifically educational measures to include assessments of social and political opinions and of personality characteristics. Thus it places educational opinions in wider contexts and makes it possible to examine the ideologies of teachers as well as the specific educational characteristics of the different groups.

The report contains so many findings at various levels of analysis that it is hardly possible to single them out here, but Dr. McLeish is probably at his best when he discusses major ideological trends such as 'progressive *versus* traditional' attitudes, when he writes on the 'profiles' of teachers, e.g., according to maturity of experience, job satisfaction, or political allegiance, and when he makes intergroup comparisons.

As he says himself, the findings are to be regarded as suggestive for further work, and he points to the unrepresentative nature of many of the samples. This latter feature should be borne in mind carefully by his readers since the sampling places important limitations upon the interpretation of the results. Thus, to use as professional groups teachers who were attending further courses of training, or students from single institutions, and to compare 'national' samples of very different professional composition, must raise doubts about some of the statistical procedures and, further, make it questionable whether this can claim to be a study of national differences. It would be advisable not to place any emphasis upon strict national/professional comparison and to regard the groups as interesting in themselves.

With these qualifications, this is a valuable contribution to teacher studies. A particularly useful feature of the publication is that it comes in attractively produced monograph form and provides not only a full account of the design, measures and results of the study but also a sound review of previous research on teachers' attitudes and an extensive bibliography. It deserves to be read widely by prospective teachers and by research workers.

A. MORRISON.

McLeish, J. (1969). *Evangelical Religion and Popular Education: A Modern Interpretation.* London: Methuen, pp. vii+206, 36s.

The histories of the literacy movements of Griffith Jones in Wales and Hannah More in the Mendip villages, are briefly sketched and interpreted in various ways. McLeish sets up a straw historian (who, among other things, fails to 'consider the total context in which the action is taking place') and knocks him down. The author's interpretations are in terms of economic, anthropological, psychological and sociological theories and conclusions are offered about the contributions made by these approaches to the understanding of the movements in question. McLeish writes: "Each of the theories examined seemed to fit the historical data more or less closely," although admittedly he adds, "some more closely than others." The theories which McLeish presents seem to be successful for two major reasons: (1) they are imprecise; and (2) they are in fact theories offered in explanation of different phenomena.

Many will be distressed at what is put forward as *the* psychological theory. It is a form of Freudian theory which relies heavily on the matrist-patrist distinction, matrists being "characterised by excessive regard for the mother-image." Griffith Jones could, we are told, be "defined best as a patro-matrist or matro-patrist. This mixture of parental images could account for his position as social and religious innovator." It is held that the "eighteenth century was predominantly patrist in its attitudes as far as the class to which Griffith Jones belonged was concerned." The problem of explaining the innovator by contrasting him with non-innovators is held to be solved by the difference between Jones' 'patro-matrism' and the predominant patrism. It seems, however, that the matrist features of Jones are inferred from the concern evidenced by his innovation. This reduces to the position that innovators innovate more than non-innovators. This tendency in McLeish's 'psychological theory' is even more evident when he turns his attention to Hannah More.

On the credit side it must be said that this was a very brave book to write. The amount of sophistication required in so many disciplines to do justice to those disciplines is indeed vast. The book's failure to shed a great deal of light on the nature of historical determinism must be seen in this context. Kenneth Pease.

Maxwell, J. (1969). *Sixteen Years On: A Follow-up of the* 1947 *Scottish Survey.* London: University Press, pp. 190, 42s.

The Scottish Mental Surveys have occupied an important place in British psychology and this book is the most recent of many distinguished works about them. It describes the final follow-up of the 1947 'six-day sample,' a sample selected so effectively from the survey population of 11-year-olds that Sir Godfrey Thomson described them as 'a Scotland in miniature.' It is no small feat that 92 per cent of the sample (1,104 of the original 1,208 children) were still co-operating in 1963, sixteen years on, when the last follow-up took place. For this congratulations are due both to the research's organisers and to the workers in Scotland and in many other countries who maintained contact with the sample members and collected the data.

This last report on the survey, like its predecessors, describes research carefully planned and painstakingly carried out, with results that have been thoroughly analysed and reported in commendable detail. A picture is drawn of a generation growing up in which the varied patterns in the stages of this development are revealed to us. The basic pattern stands out clearly. Since continuing with systematic education after school is determined more by occupational class than by level of intelligence a high proportion of very able pupils leave school prematurely and do not take their formal education further. But there is no complaint of lack of educational opportunity and some apparently untalented pupils do achieve surprising success. Those continuing their education after school are more likely to have remained in secondary education longer and this continuing education supplements, rather than compensates for, school education. This is of crucial importance with regard to employment. Those leaving school shortly after reaching the school leaving age tend to be 'employment-centred,' that is "concerned with keeping themselves in employment regardless of its nature," and willing to change jobs if the prospects seem better elsewhere. Those remaining in school longer and then continuing their studies tend to be those Maxwell labels 'vocation-centred.' They have "identified themselves with a particular type of employment, have trained for it and have tended to remain consistently in it." Consequently the critical decision, of whether to leave school or not, is made at an age of 15 or 16. "Future level of employment is mainly determined at that point." Moreover, the value of vocationally-biased courses for 'non-certificate' pupils is open to doubt.

This book is not only about the members of the six-day sample. In a short but vital chapter information about the younger sibs of the members is presented and used to check the findings on differential fertility by intelligence that were obtained in 1947. With the families of the sample now being completed, there can be no doubt as to the validity of the results obtained. And these fully confirm the earlier conclusions drawn from the incomplete families of 1947. Without question this piece of the research is the finest thing in the book. However, the other topics in this chapter are of considerable merit.

While important topics are the subject matter of this book, many of the conclusions are not original. Possibly this is inevitable and of little moment (although the almost total lack of reference to the literature is more serious). However, the presentation of sound data analysed and presented as here (in staggering statistical detail) is compensation. Indeed, it may well be that the documentation provided in this volume will prove to be one of its greatest strengths, yet at the same time it is something of a liability, for too often the book seems to deal with figures rather than real people: descriptions of sample members are used to illustrate the figures, not *vice versa*. Moreover, one has to refer to highly complex tables in order to understand the text—and there are tables on most pages: it becomes difficult to see the wood for the trees. This difficulty of reading the text is aggravated by the unhappy presentation of the material. If each chapter had a summary at its beginning and if the hypotheses were always clearly specified and if some of the tables had been relegated to appendices, then the reader's task would be considerably easier. And the absence of an index, even in a research report such as this is, is a major omission.

Were these merely criticisms of how the book is written they might matter little. But this reviewer feels that they are symptomatic of a more serious problem. The undoubted elegance of the procedures used to analyse the data conceals a considerably lower degree of sophistication at the planning stage. Thus there is evidence of considerable difficulty in classifying the different kinds of schooling, employment, occupational class, etc., and the personal characteristics chosen to describe the sample are admittedly a 'mixed bag psychologically.' A more careful formulation of the hypotheses beforehand, one suspects, could have led to the collection of more manageable, but no less valuable, information. It seems that a lot of effort has gone into producing results on more-or-less obvious lines of enquiry because the data were collected before it was decided how or why they should be used.

Indeed, had the planning been more imaginative could not the subjects, who had been wooed into co-operating for so many years, have yielded further interesting information? The sample members are now adult members of our society and were studied in their social setting; throughout the book there is heavy emphasis on the effects of social pressures and the topics studied are as much those of social psychology as of educational psychology. Yet psychologists who are interested in the social processes may look with disappointment at this book, regretting an opportunity that has not been used to the full. What is more, they might complain that the analysis of the existing data has, because of its complexity, led to a biased report which does not adequately reveal the changes and range of variation to be found in our society, or even in the subjects studied.

Sixteen Years On presents valuable findings on a number of related topics. Insofar as it deals with educational psychology it is most impressive, but where it deals with the topics of social psychology its quality is rather uneven. In some ways it seems over-ambitious and hence has failed to achieve as much as was possible. It is to be hoped that the undoubted drawbacks of this book will not prove too great a deterrent for, despite them, this solid piece of work, in the best Scottish tradition, deserves a wide readership. PETER J. MARTIN.

NUTTIN, J., and GREENWALD, A. G. (1968). *Reward and Punishment in Human Learning*. New York and London : Academic Press, pp. 205, 79s. 4d.

This is an interesting book but it does not, as the publishers state, attempt any *physiological* interpretation of reward and punishment in the shaping of memory and behaviour. It is for the most part a translation, with some commentary, by Greenwald of the Belgian psychologist Joseph Nuttin's *Tache, Reussite, et Echec* (1953) which examines the operation of Thorndike's Law of Effect in some 101 experiments with human subjects. Though it starts with Thorndike, it proposes a very un-Thorndikian explanation for the observed influences of reward and punishment and outlines a theory of learning and a theory of performance (regarded as a novel construction, based on previously acquired capabilities and current motivations, adapted to specific present situations), which puts Nuttin as a cognitivist much more in the company of Tolman and Lewin than with any connectionist. Greenwald contributes a substantial appendix reporting nine experiments of his own and a final summing up of their views on the role of reward and punishment in human learning.

The experimental tasks are mainly in the classical tradition of serial trial and error learning, paired associates, 'translation' learning, area estimation, etc., in which subjects' responses are rewarded with 'right' or punished with 'wrong.' Some are superficially replications of Thorndike's original designs, including (by Greenwald) the blindfolded line-drawing experiment. The main difference is that where the Thorndike experiments called for repetition of learned responses most of those reported here required recall of all original responses and, usually, also of the response-outcomes (i.e., whether they were rewarded or punished). There is also a detailed examination of the spread of effect phenomenon. The conclusion is, roughly, that there is no automatic strengthening of S–R connections by reward and that Thorndike's finding is an artefact of his experimental procedures. Hull's need-reduction is likewise unacceptable as an explanation. Nuttin demonstrates a marked difference between the influences of reward in *tache ouverte* (intentional learning) and *tache fermee* (incidental learning) and he would explain his findings in terms of what he calls a persisting task-tension system, task-orientation and the structural characteristics of the learning task.

One cannot fail to be impressed by the thoroughness and logical planning of Nuttin's research and by his simple but ingenious experimental designs. Greenwald also has some very interesting supplementary investigations to report. The point at issue is whether the experiments presented are appropriate as tests of Thorndike's Law of Effect. The empirical law, as Greenwald calls it, is not in doubt—reward and punishment have effects on learning: the theoretical law—*how* reinforcement influences learning still calls for further investigation. The points highlighted by Nuttin and Greenwald—task structure, motivation and the influence of instructions are obviously very important. It is a pity that the task instructions given to the subjects are not reported in more detail. A. H. D. TOZER.

PIETRASINSKI, Z. (1969). *The Psychology of Efficient Thinking* and *The Art of Learning*. Oxford: Pergamon, pp. 202 and 138, 60s. each.

These are two books of the 'self-help' variety, dealing, as their titles imply, with thinking and learning. They are translations of Polish originals, first published in 1959 and 1961, respectively. In common with others of their kind, they aim to improve the quality of the reader's mental processes by acquainting him with what is known about the nature of thinking, and by prescribing courses of action derived from such knowledge. Although this approach has a certain amount of experimental backing, its obvious defect is that, unless (as the author himself puts it) he is possessed of an 'iron determination' to practise what has been preached, the reader may gain nothing more than the ability to pass 'an examination in the technique of mental work.'

Within such limitations, books of this sort may be written well or badly, and these two have several shortcomings. Neither is particularly easy to read—a fairly serious fault where the reader can be assumed to lack adequate technique of study. Diagrams are inadequately labelled; photographs are but loosely related to the text. The core of practical advice has to be wrested from a tangle of extraneous material, including quasi-logical analyses of the formal characteristics of plans, and homilies on the virtue of self-criticism, the value of time, the nature of wisdom.

The book on thinking has some additional faults of its own. It lacks the services of an 'English arranger' and, perhaps, for this reason, manages to achieve only an approximation to general and technical English usage. The treatment here is more theoretical than in the book on learning—superfluously so, it would appear, for the reader in search of purely practical advice, who will, for example, get little from the long section on 'The Nature of the Intellect.' Yet it will not stand analysis as an introductory text on the topic of thinking. From this point of view, it is less systematic, rigorous and indeed accurate on minor details than the entirely comparable British text of the same vintage.

On the credit side, the advice given in both books is sensible, and soundly based on research findings current at the time of writing. The sections relating to technological matters—invention, and the acquisition of industrial skills—are interesting and worthwhile contributions in an area which tends to be neglected by educational psychologists in the West. In these, as in other sections, the references to Russian and Polish research are intriguing, but unsatisfactory. Understandably, in view of the public for whom these books were originally intended, Soviet research is described in considerably less detail than is the work of Western psychologists, with the result that it is largely impossible to evaluate its worth in any realistic way.

In the context in which they were first published, both books may well have been substantial achievements. However, the passage of time, the apparent difficulty of re-translating from the Polish material which, in many cases, was originally written in English and, above all, the matter of comparative cost, make it hard to justify their publication here and now. W. B. HANTON.

RICHARDSON, A. (1969). *Mental Imagery*. London: Routledge, Kegan and Paul, pp. xii+180, 35s.

Depending, as it must, on subjective reporting for much of its data, mental imagery has not been a popular subject for research since the 1920s, but the more recent resurgence of interest in the cognitive processes has yielded, as part of a vast output of research, a respectable volume of studies featuring imagery in one or other of its forms.

This book is a review of selections from this literature and concerns particularly the nature of imagery and its relation to certain other psychological processes. It is intended as a 'guide to research in the field' but it also goes some way towards providing for a long neglected topic a reorientation within the larger framework of cognitive studies.

The opening chapter is devoted to an elaboration of the author's definition of mental imagery and the rest of the book, except the concluding section, examines separately each of the main types, beginning with after-images, the conditions evoking them and the nature of recurrent and memory after-images. Eidetic imagery and its functional significance are briefly discussed but the longest chapter, as might be expected, concerns memory imagery, especially its vividness, controllability and predominant modalities. There is a useful survey of researches employing EEG and respiratory checks of subjective evidences, and the section concludes with a discussion of memory images in relation to stimulus coding, problem-solving and other processes.

Under the heading of imagination imagery the author has included a wider variety of sub-types than is traditionally contained in this category. The discussion ranges from hypnogogic imagery to perceptual isolation and the perceptual effects of hallucinogens. A number of broad, general questions are posed in the last chapter, the partial answers to which serve as summaries of the main conclusions.

Unlike many of its type, this book is far from being a catalogue of research reports. The author has resisted the temptation to exhaust the entire field, preferring to gather together a relatively few studies around selected focal points for report and comment. Whether the declared intention of giving a ' representative sample of facts and hypotheses ' has been fulfilled is a matter for readers to decide, but some will certainly feel that the almost total neglect of developmental and educational themes diminishes the usefulness of the book—only one of the Harvard studies is cited while the Genevan literature has been entirely ignored.

Nevertheless, the selection, though it may not be truly representative, is sufficiently broad to serve as both a reference for undergraduate students and a guide for further research. T. E. WYNNE.

STROM, R. D. (1969). *Psychology in the Classroom.* London: Prentice-Hall, pp. 461, 75s.

This is an unusual text in that it explicitly eschews a comprehensive treatment of psychology in the educational context in preference for a selective exploration of topics. The choice of themes may be regarded as somewhat ill-balanced, reflecting the author's particular interests and strengths more than a concern for the contribution of psychology to the understanding of classroom situations.

The first chapter studies individual differences, their kind and origin; here an emotionally tinged chastisement of adults and particularly teachers as responsible for student unrest is out of place. There follows a detailed review of research on educational wastage in the USA, which is technically good if parochial in its outline of wastage problems. Strom's selective presentation of learning theories would be acceptable if teaching method were not seen as directly derivable from the resulting collage. This is, in terms of scholarship, the weakest chapter. By contrast, the study of research on creative behaviour is up-to-date, comprehensive and balanced. Classroom evaluation is orthodoxly and properly presented in an historical setting, without such oddities as the elaborate treatment of phrenology in the chapter on learning theories. The final chapter, on mental health and personality development, is written exclusively from the point of view of depth psychology and social anthropology and its plausible and sometimes facile explanations are supported by authoritative assertion. The book concludes with an appendix on teacher-assessment, which is principally a listing and description of instruments administered by the author " to better acquaint myself with teachers."

This is not a book for the student-teacher although it might be used in a course of further professional study by trained and experienced teachers. Its language assumes an acquaintance with technical terminology. The style, particularly at the beginning of the book, is dull and although there is a thematic articulation of chapters, the continuity and coherence of the whole is not sustained. It would, perhaps, be better to regard the work as a collection of readings, where one would not be surprised to find statistical concepts being used before they are explained. For British readers, the restriction of the examples and of the assumptions about institutions to the United States will be irksome, if not an outright handicap.

M. A. BRIMER.

TELEVISION RESEARCH COMMITTEE (1969). *Second Progress Report and Recommendations.* Leicester: University Press, pp. 106, 12s. 6d.

This 100-page paperback is a condensed account of the origins, objectives and achievements of the Television Research Committee set up in 1963 with financial support from the ITA and subsequently from the BBC, SSRC, Schools Council and other sources. The first part of the book, which repeats material from earlier reports, tells the story of this remarkable co-operative endeavour by highly diverse agencies, institutions and individuals in setting up a flexible framework for an attack on the immense problems of television research. The second part of the book contains an account of five representative research studies supported by the committee. The first of these is concerned with the viewing habits of delinquents, the second with social and personality factors associated with particular tastes in viewing. The third is an interesting comparison of the producers' declared intentions with children's actual reactions to a single programme. The next is a comparison of the varied reactions of children of five European countries to a prize-winning film and the last describes a survey of children's television facilities throughout Europe.

All but one of these studies were undertaken at Leicester, though the balance sheet shows that substantial grants have also been made for work now in progress at the Universities of Aberdeen, Birmingham and the London School of Economics. The range and scope of the enquiries now in progress seems quite remarkable and especially so when one finds that all of this work spreading over the first five years has been accomplished for a quarter of the sum spent every single year by television organisations in Britain alone on the quite trivial problem of audience measurement.'

It is a pity the committee (which is now contracting itself to a small nucleus of trustees), has compressed its 'Future Policy and Recommendations' into five short pages. These sweep across the whole field of the mass media, embracing such questions as the training and social responsibility of mass communicators and the relationships between programming and financial control. They also suggest guidelines for future research, exhorting future researchers to "ask questions about the positive potentials of the media, how they could be used in broadening or developing taste, increasing social participation, improving international understanding and reducing prejudice."

This exciting and important material deserves far more than five meagre pages. Can we not hear more about the whole committee's deliberations before it is dispersed?

JOHN LIGGETT.

THOULESS, R. H. (1969). *Map of Educational Research.* London: National Foundation for Educational Research, pp. xi+331, 60s.

'Map' is a well-chosen title: this book does give many of the pleasures of poring over a map—the satisfaction of finding clear statements of what one knows, fascination in discovering exotic items that one did not know, awakening curiosity at the sight of large unexplored tracts delimited only vaguely by folklore. The map has the further merit of being based on observations collected during a respectable span of years and not merely on work done within the past five years or a Ph.D. student's reading span.

Dr. Thouless has clearly realised that teachers are often concerned about teaching school subjects rather than with studying learning processes, so the chapters deal not only with the familiar psychological topics of conceptual development, intelligence testing, handicapped or maladjusted children, etc., but also with the problems of teaching mathematics, science, foreign languages and other subjects, including religion. This awareness of the teacher's point of view is shown repeatedly; the author deplores the lack of enthusiasm many teachers show about educational research, but also points out that this may occasionally be because the research is not really helpful to the teacher.

For all readers the survey has the merit of giving a clear picture of what results so far achieved really add up to; we escape the nagging uncertainties caused in too many other surveys by undiscriminating references to often discrepant minor works and straggling analyses which arrive at no conclusions. Clarity is increased by deliberate (though not exclusive) concentration on research in the UK: as the author rightly observes, much American research is irrelevant to conditions here and has, moreover, been largely summarised elsewhere. This resolute process of selection is reinforced by a style which is lucid and succinct, as we should expect from Dr. Thouless (and from Professor Wiseman, who provides an information-packed appendix, bringing up to date the basic text which was completed in 1965). But the first chapter on design and analysis of research is so full of important technical points that it could cause terror in the novice who should probably take later and more gradually the excellent principles stated there. Specialists in various areas could doubtless find omissions, but within its compass the book does all that could reasonably be expected. A well-chosen and mercifully selective list of references supplements each chapter, but although the chapters are fairly self-contained an index would have been worth including.

In all, the map tells clearly what is known and provides stimulating suggestions for further work. It also conveys the author's concern that psychology and education should work together—it may even convince teachers that psychology can be of relevance and practical use in the classroom. M. B. SUTHERLAND.

VERNON, M. D. (1969). *Human Motivation.* London: Cambridge University Press, pp. 189, cloth 45s., paper 13s.

An unqualified title such as *Human Motivation* leads one to expect not merely a clear and up-to-date account of the ascertained facts (as generally accepted by reputable psychologists) and the leading theories in the field today, but also an authoritative assessment or evaluation of the respective merits of the latter. The account one will get here and in fully adequate detail; but the assessment one will hardly find at all, for the appendix on "Assessment" deals only with identification and measurement (or estimation), not with an evaluation of the relative merits of rival theories. True, the author excuses this in her foreword, but few read a foreword before buying a book because of its title. The very lack of bias with which Professor Vernon writes renders it the more difficult to guess which type of view she regards with most favour.

The author has classified her material under the following chapter-headings: (1) The nature of motivation (R. S. Peters' *The Concept of Motivation* is, surprisingly, not mentioned); (2) Development in children; (3) Biological needs; (4) Emergency reactions (i.e., fear and fight); (5) Emotions; (6) Activation and exploration; (7) Social motives; (8) Goal-directed behaviour; (9) Frustration and conflict; (10) Individual differences. In all psychological writing there is bound to be considerable overlap with any scheme of subdivision, but are the needs to escape from danger and resist attack not 'biological'? Or are 'sentiments' (chapter 8) more 'goal-directed' than instincts (drives, urges, needs, propensities, or what you will); is it not only that human beings are more *conscious* of the goal in the former case? A division into 'unlearned and 'acquired' motives might have been preferable.

Professor Vernon is not very selective as to what views should be given in greater detail than others; she appears to think all worthy of more or less equal treatment. In many cases this may well be so; but she has here missed a chance to redress an imbalance that has afflicted recent British accounts of motivation, such as Fletcher's *Instinct in Man.* The modifications of McDougall's hormic system offered by James Drever, Sen., have been largely ignored; yet these modifications go a long way towards removing some of the objections to McDougall's system: specifically those stated (or implied) by Professor Vernon on pp. 5 and 71. She would have done well to consult Drever's article on "Instinct in Man" in the 1947 *Encyclopaedia Britannica* and also to have made some reference to R. B. Cattell's factorial work which has gone far to confirm McDougall's list of instincts (under the name of 'ergs.')

Drever's two main suggestions may be briefly stated as follows: (1) We do *not* experience emotion every time an instinct is at work—only when its action is impeded or (suddenly or unexpectedly) facilitated. In the former case we have an unpleasant emotion, in the latter a pleasant one. Thus, with each instinct there belong *two* emotions (if any) of opposite polarity—not *one* as McDougall held. (Some instincts, however, such as mimesis and play, have no specific emotion at all.) (2) But what we *do* experience invariably when an instinct has been aroused is *interest*—a ' feeling of worthwhileness,' as Drever calls it. (Hence the tremendous importance in education of skill in arousing pupils' instincts.)

Professor Vernon does not give, let alone accept, McDougall's analyses of ' complex emotions ' ; indeed, she says they ' cannot be analysed ' (p. 81). But she seems to accept without adverse comment his doctrine of sentiments and his view of the ' self-sentiment ' as the *master* sentiment. She tends, however, to interpret the term somewhat narrowly ; it can be so defined as to include tastes, interests, attitudes and even prejudices, to which she allots separate sections. Thus, the taste for Bingo and for Bach are both sentiments, as are all religious, political and racial prejudices.

This book affords on the whole a sound and comprehensive introduction to the study of motivation for, say, second-year psychology students ; but it is too all-inclusive and contains too little evaluation, to be entirely suitable for students of education, though reference to parts of it could be profitable and they would enjoy the touches of humour with which its pages are lightened. JOHN R. MORRISON.

NEW JOURNAL

The Journal of Educational Technology is the official journal of NCET, the national council set up after the Brynmor Jones Report. The editor, Norman MacKenzie, Director of the Centre for Educational Technology in the University of Sussex, explains that the main objectives of the journal are to meet a " need for an informal dialogue, to provide links between research workers and teachers, educational planners and administrators and between public educational systems and the broadcasting, publishing and other information agencies . . . to report the work that is now going on to develop new media and methods and apply them to a wide range of learning situations—in schools, in further and higher education, and for training in industry and the armed services . . . The first issue already reflects this range of interests and plans for subsequent issues include articles on developments in educational technology in Australia and Africa ; on new methods in industrial training and new dimensions in language teaching ; on the mental development of learners ; and on the education industry in the USA. Contributions from Sweden and Holland are also scheduled for publication in the course of 1970."

Articles in the first issue include : " British Universities since the Brynmor Jones Report " ; "Audio-Visual Resources in Sussex Schools " ; " Micro-teaching " ; " Broadcasting and the Open University " ; " Problems of Conceptual Learning " ; and " Computers in Education." Subscriptions (£3 10s. per annum, three issues a year) should be addressed to : Councils and Education Press, Ltd., 10 Queen Anne Street, London, W1M 9LD.

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PSYCHOLOGY IN GREAT BRITAIN

Edited by B. M. FOSS

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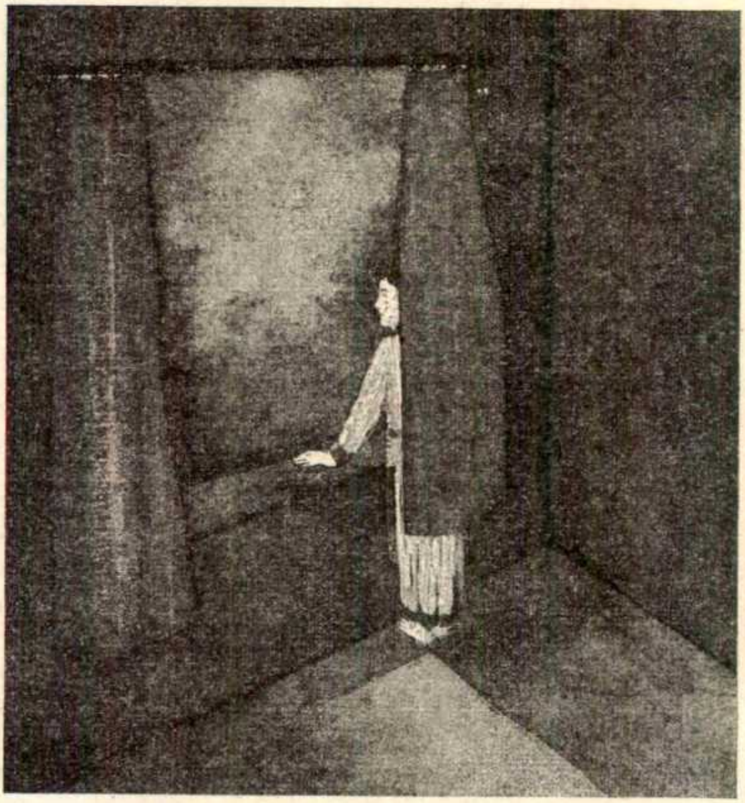

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VERBAL LABELLING AND CONCEPT FORMATION IN PRIMARY SCHOOL CHILDREN

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SUMMARY. 30 primary school children aged 7 years, 9 years and 11 years, were given the standard Vigotsky sorting task and specially constructed extension tests. 30 other children of the same ages were given identical tasks except that the nonsense syllables were omitted from the base of the experimental blocks. Most of the children using the labelled blocks, but hardly any children using unlabelled blocks, succeeded in the extension tests. The extent to which these results bear on the problem of the relationship between concept formation and the use of language is discussed.

I.—INTRODUCTION.

THE present study follows earlier work using adaptations of Vigotsky's apparatus and experimental approach to investigate concept formation in primary school children (Fothergill, 1967 ; Stones and Heslop, 1968). These earlier studies were primarily concerned to check Vigotsky's findings about the cognitive operations involved in concept formation and their relationship to success in applying newly acquired concepts. Stones and Heslop found Vigotsky's model appropriate to the classificatory behaviour of children from a junior school of high socio-economic status and Fothergill, in a study of West Indian children from a junior school of low socio-economic status, found comparable groupings and very similar transfer test results. Both studies found that verbal ability was more closely related to level of sophistication of thinking as revealed by the classifying operations than was non-verbal ability, although the verbal ability of the West Indian group (as measured by Simplex scores) was considerably below that of the high socio-economic group.

It would seem, therefore, that although existing level of verbal ability correlates with level of cognitive operation in the sorting task it may not be the crucial factor in the formation of the concepts. The problem is compounded by the unsatisfactory nature of instruments used to assess ' verbal ability.' Were a valid test of language proficiency available it would be possible to use this as an independent variable. However, there is by no means a consensus on what language proficiency is, and thus any test which might be used to assess language ability is open to question.

Some writers in the field do not distinguish between the effect of a learner's *existing* level of language proficiency on concept formation and the influence of the *use* of language in concept formation tasks. Vernon (1967) reviewed 33 research studies in which performance of deaf children in a variety of performance scale IQ tests was compared with that of normal children. In his view the performance tests were the best available measures of the thought process and the deaf children offered a suitable experimental group for a study in which language is the independent variable. He found the performance of the two groups of children similar. He concluded that there " . . . is no functional relationship between verbal language and cognitive or thought processes." He also concluded that there " . . . is no relationship between concept formation and level of verbal language development." Both these conclusions confuse the correlation between existing levels of competence in verbal language performance with the effect of language on the formation of new concepts. There is also the added problem that normal children might use verbal language in cognitive processes whilst deaf children might make use of other means of symbolisation.

In experiments with children 15 months old, Liublinskaya (1957) used a design resembling a learning set experiment to investigate the effect of language on concept formation. Two groups of children were given discrimination tasks which involved the selecting of taller or shorter objects, or objects differing in colour. The control group were reinforced with a sweet every time they chose the 'correct' object. When children in the experimental group chose the 'correct' object the experimenter reinforced with a sweet but also said 'tall' or 'short' or 'red' or whatever the required criterion of discrimination was. The word thus acted as an invariant in situations which changed with each presentation. Liublinskaya found that the experimental group learned the discrimination more rapidly than the control group, transferred their learning more effectively and retained it much better than the control group. McNeill (1968) replicated this experiment with nursery school children and obtained similar results. Experiments like these are focusing upon the effect of language used as an aid to concept formation rather than correlating existing competence in two fields.

Most writers on the subject do in fact, take the view that language is important for concept formation. Vigotsky (1962) himself, Luria (1959) and many Soviet psychologists consider it fundamental.

Ausubel (1963) supporting a similar position cites evidence from a number of researches. Gagne (1965) and Bruner (1966) also consider language to be important in concept formation, while Inhelder and Piaget (1964) stress the importance of language for classification.

Vigotsky's original experiments using the Vigotsky blocks involved classificatory activities. Vigotsky's main interest lay in the thinking processes *en route* to concept formation and although he reports on extension tests he says nothing about the use of a control group to determine how far the experimental group had been helped in the sorting task by the presence of syllables on the underside of the blocks.

Goss and Moylan (1958) made one approach to the problem when they investigated the influence of different levels of mastery of verbal discriminators on concept formation using Vigotsky type apparatus. However, the subjects in their experiment learned the labels for the concepts *before* attempting the sorting task. Performance in sorting increased as a function of the degree of prior mastery of the labels. Criterion performance in this experiment was the number of correct placings of the blocks. The experimenter did not test the transferability of the new concepts and from the evidence presented, it seems likely that many subjects did not, in fact, learn the new concepts.

The implication in experiments such as the one by Goss and Moylan, that the words used are merely symbolic handles which facilitate the storing of concepts, is a limiting view. It is limiting because it does not distinguish between the *labelling* and *process* function of language (Ausubel, 1968). Language used just to name concepts formed by subverbal means is merely being used as a label. But the *process* function of language is an integral part of cognitive activity actually facilitating concept formation through the symbolic nature of words. In Vigotsky's words cognitive activity is "... guided by the use of words as the means of actively centring attention of abstracting certain traits, synthesising them and symbolising them by a sign." The present experiment was designed to test the hypothesis that the availability of the nonsense syllables in the Vigotsky task facilitates concept formation.

II.—PROCEDURE.

Apparatus.

The apparatus used for the concept formation task consisted of (*a*) the standard Vigotsky blocks (see Stones and Heslop, 1968, for full details) and (*b*) a set of blocks identical except that they did not have the nonsense syllables on the base.

The materials for the first extension test consisted of 17 three-dimensional everyday objects of varying shapes, colours and functions which could be grouped in the same way as the original blocks. The objects were sufficiently dissimilar in size, shape and colour from the blocks to preclude any transfer by primary stimulus generalisation.

They comprised the following objects which were of a variety of colours and materials.

Group 1 (*LAG*) : Toy plastic bison ; small plastic mug ; cardboard box.
Group 2 (*MUR*) : Toy giraffe ; small candle ; torch battery ; toy pedestal.
Group 3 (*BIK*) : Rubber wash basin plug ; match box ; bangle ; small saucer ; flat rectangular purse.
Group 4 (*CEV*) : Very small toy telephone (doll's) ; very small toy monkey ; ring ; pencil sharpener ; die.

The materials for the second extension test comprised 16 cards on each of which is a ' three-dimensional ' drawing of an object. The cards can be correctly grouped by the height and width criteria both by the size of the actual drawings and the relative sizes of the depicted objects seen as three-dimensional everyday objects. Again there is a variety of shape and function, and the pictures comprised :

Group 1 (*LAG*) : Shopping basket ; bucket ; birthday cake ; saucepan.
Group 2 (*MUR*) : Bottle ; candle in a candlestick ; vase ; block of wood.
Group 3 (*BIK*) : Pie ; chocolate box ; book ; frying pan.
Group 4 (*CEV*) : Clock ; ink bottle ; apple ; cup.

The number of objects in these two tests was deliberately made different from the number of blocks to avoid the subjects' thinking there was some numerical basis for classification.

Subjects.

The sample comprised 60 children randomly selected from a primary school; 20 aged 7 years, 20 aged 9 years and 20 aged 11 years. The children in each age group were then assigned randomly to experimental and control groups.

The classification task.

This stage of the experiment is a learning task. The subject has to learn the criterion of classification, i.e., height and cross-sectional area and also the names of the concepts, i.e., LAG, BIK, CEV and MUR. Vigotsky held that the two tasks were mutually facilitatory, but in particular, that the use of the nonsense syllables as names of the concepts would assist the learner to form the concepts. When the concepts are learned, therefore, the syllables are no longer nonsense but are meaningful words symbolising the newly acquired concepts. In order to check this view it was necessary to compare subjects using the syllables in forming the concepts with subjects denied the use of the syllables. In the present experiment, therefore, one group of children were set the concept formation task using standard blocks with nonsense syllables, while the other group were given the same task but using the blocks without nonsense syllables.

The experiments were all conducted in a quiet room in the subjects' own school. Before the subject entered the room the blocks were spread randomly and covered. When rapport had been established the blocks were revealed. The experimenter explained that the blocks could be placed into four groups and the task was to arrange them in the correct groups. The experimenter drew the subject's attention to a focus block. In the case of the standard blocks the focus block was upturned to reveal the label. In the case of the blocks without labels, the experimenter clearly touched the focus block. In both cases the experimenter asked the child to start by putting together all the blocks that went with the focus block and then to carry on with the remaining groups. In all the trials the same block was used as a focus. The subjects were free to move any of the blocks at any time during the experiment. In the case of the blocks with labels the subjects were directed not to upturn them.

When the subject had attempted a grouping and was reluctant to make further moves, the experimenter indicated an incorrect block in a group. In the case of the blocks *with* labels the incorrect block was upturned to reveal the nonsense syllable ; in the case of blocks without labels an incorrect block was clearly indicated by the experimenter. In both cases the experimenter stated that the block was incorrectly placed but did not move it. The subject was then encouraged to continue with the sorting task.

No time limits were set and the trials were continued until all the blocks were correctly placed so that at the end of each session the subject had before him a correctly grouped array of blocks. Trials were carried out using blocks with labels and without labels alternately throughout the day. Standard procedures were followed rigorously by the experimenter.

The extension tests.

When a subject had completed the sorting correctly, he was given the following tests :

(1) The successfully grouped blocks were removed from sight. A large plain board carrying an identical set of blocks was presented. These had already been spread at random and did not show any labels. The subject was asked to group them as before. The blocks were then removed from sight.

(2) The 17 three-dimensional objects were presented and the subject was asked to group them in the same four groups as the blocks. The objects were cleared away before the next test.

(3) The 16 cards were presented and the subject asked to group them in the same way as the blocks.

(4) The English Picture Vocabulary Test (EPVT) was also administered on a group basis as a group test of language ability. This test was chosen because of its focus on language and because it is independent of reading ability.

Scoring.

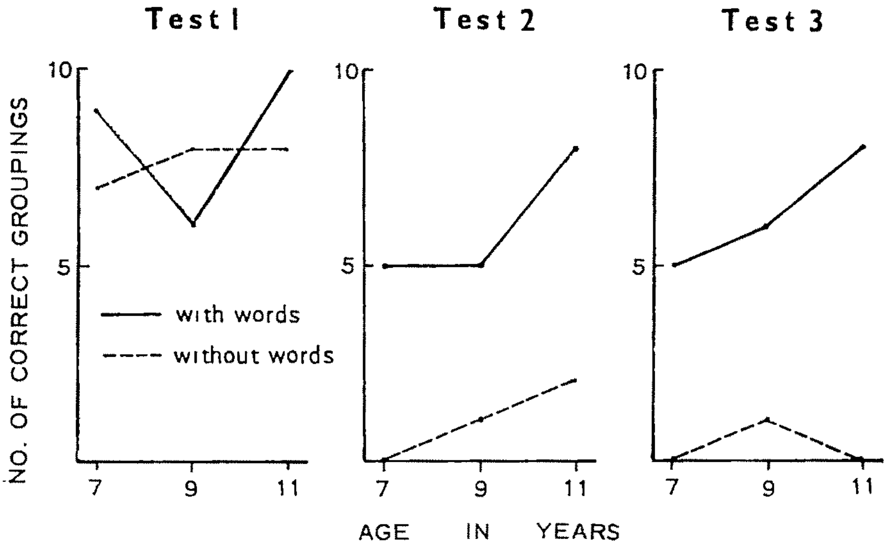
Although it is probably possible to devise a graded scoring scale for the extension tests it was considered more unequivocably valid to adopt dichotomous categories. Therefore, a subject who did not place each piece of apparatus correctly was considered to have failed the extension tests.

III.—RESULTS.

The children's performance on the three tests was analysed to bring out the effect of age, EPVT score (high-low) and, in accordance with our prime aim, the effect of the nonsense syllables. Figure 1 shows the performance of subjects at different ages. On the first test (regrouping the blocks) children in all the age divisions from both treatment groups had little difficulty in regrouping the blocks. On test 2, the three-dimensional object sorting test, there is a slight tendency for older children to score more highly but the most striking result is the superiority of the performance of the group using blocks with labels. On test 3, the card sorting task, the children using labelled blocks performed much more effectively than the control group.

FIGURE 1

PERFORMANCE OF SUBJECTS AT DIFFERENT AGES.



(test I) Number of children of different ages regrouping correctly
(test 2) Number of children grouping three dimensional objects correctly
(test 3) Number of children grouping cards correctly

Table 1 summarises the results on the three tests bringing out the effect of the EPVT score, the main influence being on the performance of children on tests 2 and 3 working with labelled blocks. Correlation coefficients between the three tests and EPVT scores are shown in Table 2.

TABLE 1

NUMBER OF CHILDREN IN DIFFERENT CATEGORIES SUCCEEDING IN THE THREE TESTS.

	With words		Without Words	
	High EPVT	Low EPVT	High EPVT	Low EPVT
Test 1	14	11	12	11
Test 2	12	6	1	2
Test 3	13	6	1	0
N	15	15	15	15

TABLE 2

INTERCORRELATION OF EXTENSION TESTS AND EPVT SCORE.

	Test 1	Test 2	Test 3
EPVT	·2374	·3235	·2928
Test 1.....................		·3669	·2652
Test 2.....................			·8154

IV.—DISCUSSION.

The main finding which emerges from the experiment is the pronounced effect of the syllables on performance in tests 2 and 3. Scarcely any of the children using blocks with no syllables (3 out of 30 in test 2 and 1 out of 30 in test 3) succeeded in the extension tests, whereas the majority using blocks with syllables (18 out of 30 in test 2 and 19 out of 30 in test 3) were successful.

The effect of level of achievement in EPVT is also of importance in performance in tests 2 and 3. However, this applies only to the group using the syllables. It thus appears that existing language competence is influential in concept formation only when the labels are available in the process of abstracting and symbolising. Results of earlier experiments (Stones and Heslop, 1968 ; Fothergill, 1967) are compatible with this finding since both experiments used blocks with labels and both found verbal ability to be correlated with degree of conceptual sorting.

The pattern of performance in test 1 is very different. Here no one factor is dominant. It seems reasonable to suppose that the explanation for this difference between performance in test 1 and performance in tests 2 and 3 is that they are testing different things. Test 1 is probably a test of short-term memory. All the child has to do is to group an identical collection of blocks in exactly the same way as those which he has just seen grouped correctly. In tests 2 and 3 the apparatus is perceptually completely different from the blocks, and the recollection of the way the blocks were grouped is of no help in grouping the new material. The intercorrelation of results on the extension tests confirm that test 1 is measuring something different from tests 2 and 3. Tests 2 and 3 correlate highly with each other but considerably less with test 1.

Thus, the syllables were of key importance in the concept formation task. Children of different ages and verbal abilities working with unlabelled blocks almost all failed to cope with tests 2 and 3 which demand the application of newly-formed abstractions to novel concrete problems. Success in such a task is the most convincing demonstration that a concept has been learned and in the main only the children using blocks with labels succeeded.

A further observation can be made about the difference in achievement on test 1 as compared with tests 2 and 3. Test 1 could be regarded as an achievement test based on recall. Success on such tests does not always guarantee a grasp of the concepts involved. On the other hand, tests 2 and 3 may be regarded as transfer problems which can be solved only by a subject who has learned the concept. Success in tests such as test 1 may indicate no more than successful rote learning. Success in tests like 2 and 3 indicates successful conceptual or ' meaningful ' learning. Thus, the results of the experiment provide an illustration of the need to provide test items which, in their specific application, go beyond what has been taught or learned, whilst still making use of the underlying concepts and principles.

The extent to which the results of the experiment bear on the problem of the relationship between language and concept formation turns on the way language is defined. Blank (1968) reviewing experimental approaches to concept development cites a range of experiments in which labelling is considered to be use of language. Lunzer (1968) considers language as a set of symbols with extra linguistic referents. Brown (1968) refers to words as sounds or shapes that symbolise referents (including abstractions). Bloomfield (1926) considers that "A word is . . . a form which may be uttered alone (with meaning) but cannot be analysed into parts that may (all of them) be uttered alone (with meaning) . . . The totality of utterances that can be made in a speech community is the language of that speech community." Finally, an interesting and highly relevant comment by Carroll (1964). " In certain psychological experiments, the experimenter and the subject in effect constitute a miniature speech community; the experimenter arranges matters, say, so that the subject gets rewarded only if he learned to say ' zik ' when he sees ' moq,' or the experimenter plays a game with the subject in which the latter must discover what classes of stimuli are to be called ' zugs '."

Although there is no precise consensus of opinion on the criterial attributes of language, the views of the authorities cited suggest that it is not unreasonable to consider the way in which the nonsense syllables are used with the Vigotsky apparatus as the use of language. Vigotsky's own approach is probably accurate, i.e., the nonsense syllables gradually acquire the function of words as the experiment proceeds, so that for the subject who successfully abstracts the critical attributes of the concepts the syllables are no longer ' nonsense ' but meaningful symbols of the new concepts. The syllables are, of course, meaningful words to the experimenter from the outset and at the end of the experiment we have a miniature speech community in which the labels are meaningful words.

It may be argued, however, that even if we accept the view that the syllables act as words, our findings do not provide evidence of a unique function of language in concept learning, and that other cues on the blocks such as numbers or abstract designs could have produced the same effect. Indeed, Semeonoff and Trist (1958) used numbers to identify the groups and make the point " . . . that a nonsense syllable or another ' name ' would have done just as well." We accept this argument and agree that a variety of symbols could probably have been used in place of the syllables. We would stress, however, that the point is not whether other things could have had the same effect but whether, in fact, the syllables did. The key difference between using syllables and other methods of identifying the groups lies in the fact that only the syllable learning condition exactly duplicates the conditions of normal word and (conceptual) referent learning in the adult speech community.

We are, therefore, of the opinion that the present experiment does indicate that the use of verbal labels facilitates the learning of concepts and demonstrates an important function of language. We say nothing about the detailed effect of the use of labels. Clearly the availability of words provides cues to help focus attention and it provides feedback not otherwise available. Some of these problems will be the subjects of further experimentation.

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AN EXPLORATORY STUDY OF TEACHERS' PERCEPTIONS OF THE PROCESS OF PLANNING COURSES

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SUMMARY. Some 261 secondary school teachers were asked to rate twelve paired elements for their importance as constituent aspects of the process of planning a course of study. The aim was to estimate the level of importance they accorded each element, their degree of agreement and to analyse the way in which they perceived the relationship between the elements in the process of planning. Their perceptions of a curriculum plan as a ' guide ' or as a ' mandatory statement ' were also studied. From the data arising a tentative description of how teachers perceive the process of planning is developed. It suggests that teachers perceive the process as calling for a consideration of those factors which constitute the context of teaching and requiring reference to a range of evaluative criteria, an important one of which may be the interests and attitudes which pupils show in their course of study.

I.—INTRODUCTION.

THE current curriculum reform movement in England has imposed on teachers many new tasks not least that of planning new courses of study. This has directed the attention of many educationists to the principles and theories of curriculum planning and made them sharply aware of the paucity of empirical data underlying these principles and theories. Schwab (1969) has cogently revealed the desperation in the United States which these inadequately grounded theories have created and recommended a more *ad hoc* approach to theory building. Even a cursory inspection of the work on curriculum planning produced in the United Kingdom in the last few years will give rise to the same sense of inadequacy. Much of it derives from the elementary rationales and paradigms evolved by Tyler (1950), Bloom (1956) and their co-workers at the University of Chicago and pays little regard to the factors most characteristic of the English educational system and, in particular, to the centrality of the practising teacher in the curriculum planning process.

The empirically based work of Eismer (1967) and Jackson (1968) suggests that the practising teacher sees the attention, interests and attitudes of his pupils as major criteria to be employed in planning courses of study though in neither case is their work of sufficient scope to permit generalisation. Johnson (1967, 1969), working at the theoretical level, argues that teachers regard a curriculum plan more as a guide to their teaching than as a statement of the rules which are to govern its form and style. Work on the role of the teacher indicates that teachers perceive curriculum planning as a legitimate professional activity (Musgrove and Taylor, 1969 ; Edman, 1968).

This work apart, there has been no systematic study of how teachers perceive the process of curriculum planning, of the criteria they might employ, of how the criteria are related or what purpose the outcome of planning is to serve. In the absence of such work it is difficult to see how a viable, practically useful theory of curriculum planning can be developed. Without such a theory the development of a coherent strategy of curriculum reform may prove impossible to achieve. The study to be reported here is an attempt to contribute both to the development of a practically useful theory of curriculum planning and to raise issues in relation to a viable strategy of curriculum change.

II.—PLAN OF THE STUDY.

The research reported here is one aspect of a larger study undertaken on behalf of the Schools Council and is concerned with exploring the weightings and inter-relationship of criteria employed by secondary school teachers in planning their courses. It also reports their judgments on the purpose to be served by planning and suggests a tentative description of their perceptions of the process of planning courses.

The background to that aspect of the larger study to be reported here was one of the extensive discussion with teachers, the pilot try-out of several rating scales, and the content analysis of a wide range of syllabuses used in secondary schools.

The instrument used was a Likert-type rating scale of 24 items concerned with the plan for a course of study and was made up of 12 items cast in each of two forms; as a mandatory statement and as a permissive statement. For example:

"A plan should be a *guide* to the interests and attitudes of pupils."

and

"A plan should be a *statement* of the interests and attitudes of pupils."

The 24 items covered the following 12 constituent elements of curriculum planning. The numbers in brackets refer to the items given in full in the Appendix:

(1) (17) the interests and attitudes of pupils
(2) (9) subject matter employed in teaching.
(4) (14) teaching methods to be used.
(3) (16) the ordering of subject matter
(5) (12) the materials and resources available
(6) (19) the philosophy behind the teaching of the subject
(7) (20) the use of teaching time
(8) (11) what pupils are intended to learn
(10) (21) criteria for judging the effectiveness of a course
(13) (22) the aims of a course
(15) (23) knowledge to be achieved through a course.
(18) (24) the success of courses of a similar kind

Each of the 24 items was placed in the scale in random order and teachers were asked to rate them using a 1 to 5 rating for their importance as constituent attributes of a plan for a course of study. An attribute of considerable importance was to be rated 1 and an attribute of little or no importance, 5.

Some 261 secondary school teachers drawn largely from non-selective schools completed the rating scale. This represented almost a 60 per cent return of the questionnaires containing the scale. The teachers were drawn about equally from three major subject areas: English, Geography and Science. An analysis of variance indicated that there were no significant differences due to subject area or sex and the sample population was, therefore, treated as a whole in all subsequent analyses.

III.—RESULTS.

(1) *Weighting accorded each of the 24 attributes of a plan.*

Table 1 indicates the means and standard deviations for each of the items grouped according to mean value and indicates the level of agreement based on their standard deviation. Low means indicate high rating and high means a low rating. A low standard deviation indicates close rater agreement.

A guide to the interests and attitudes of pupils and a statement of the aims of a course loom large as valued attributes of a plan of a course of study, though a statement of and a guide to the philosophy behind the teaching of a subject, a statement of and a guide to what pupils are intended to learn, and a statement of and a guide to the knowledge, principles and skills to be achieved in teaching the course are also highly valued.

TABLE 1

ITEMS GROUPED BY MEAN VALUE.

Item No.	Mean	sd
1 (g) Interest and attitudes of pupils	1·84	0·81
13 (s) A statement of aims	1·85	0·83
2·0		
2 (s) Subject matter	2·15	0·91
6 (g) Philosophy	2·13	1·02
8 (s) What pupils are intended to learn	2·23	0·89
9 (g) Subject matter	2·11	0·73
11 (g) What pupils are intended to learn	2·00	0·81
15 (s) Knowledge, principles and skills	2·50	1·04
22 (g) To aims	2·17	0·83
23 (g) Knowledge, principles and skills	2·22	0·86
2·5		
3 (g) Ordering subject matter	2·60	0·98
4 (g) Teaching methods	2·77	1·05
5 (s) Materials and resources in teaching	2·90	1·11
12 (g) Materials and resources in teaching	2·53	1·01
17 (s) Interest and attitudes of pupils	2·52	1·09
19 (s) Philosophy	2·80	1·23
20 (g) Teaching time	2·94	1·04
3·0		
7 (s) Teaching time	3·19	1·00
10 (s) Criteria	3·21	1·03
14 (s) Teaching methods	3·31	1·08
16 (s) Ordering subject matter	3·13	1·12
21 (g) Criteria	3·02	1·00
3·5		
18 (g) Success of similar past course	3·52	1·19
24 (s) Success of similar past course	3·69	1·10

g—guides. s—statement.

Least valued attributes of a plan were a statement of and a guide to the criteria to be used in judging the effectiveness of a course together with a statement of and a guide to the success of similar courses in the past. Also of low value were statements concerning how teaching time was to be employed, what teaching methods were to be used and how subject matter was to be ordered.

Judging from the standard deviations, teachers were in most cases in reasonable agreement about the value to be accorded to the different attributes of planning a course. The five marginal exceptions to this generalisation were *statements* concerning materials and resources for teaching, the interests and attitudes of pupils, the philosophy behind the teaching of the subject, teaching methods and the ordering of subject matter for teaching.

It is of interest to note that the attributes of planning a course generally considered important by the teachers relate to the aims of teaching it, the interests and attitudes of the pupils, the subject matter to be employed and the objectives it is to serve. Least important attributes, on the other hand, relate to directives which could control how the teachers employ teaching time, the teaching methods they use and the way in which they order subject matter for teaching as well as to the evaluation of the course. In short, teachers value the sense of purpose which may be provided by a plan, the way it indicates what they have to teach, provides a rationale for this, is sensitive to the interests and attitudes of pupils, provides a guide to the objectives to be achieved in teaching, but leaves them free to determine how best to achieve these objectives. They value least the imposition of a form and style of teaching and anything to do with evaluation.

(2) *Teachers' preference for a plan as a guide or a mandatory statement.*

A comparison of the differences between each pair of items, as a guide and as a statement, is given in Table 2, together with an estimate of the significance of the difference between the means of each pair of items. In only one instance was there a significant preference for an attribute of planning to be mandatory and that was in the case of the aims of a course of study. In all other instances except for the subject matter to be employed where there was no preference either way, there was a significant preference for the attributes of a plan to be given as a guide. This finding goes some way toward supporting Johnson's (1967, 1969) theoretical proposition, though the possibility that the teachers merely reacted more favourably to the word ' guide ' than to the word ' statement ' should be borne in mind.

TABLE 2

COMPARISON BETWEEN PAIRS OF ITEM MEANS (N=261).

Item	Statement	Item	Guide	Diff.	t	P
17	2·52	1	1·84	0·68	8·75	·001
2	2·15	9	2·11	0·68	1·43	NS
16	3·13	3	2·60	0·53	5·56	·001
14	3·31	4	2·77	0·54	5·56	·001
5	2·90	12	2·53	0·37	4·44	·001
19	2·80	6	2·13	0·67	7·73	·001
7	3·19	20	2·94	0·25	3·33	·001
8	2·23	11	2·00	0·23	2·50	·05
10	3·21	21	3·02	0·19	2·22	·05
13	1·85	22	2·17	—0·32	5·71	·001
15	2·50	23	2·22	0·28	3·33	·001
24	3·69	18	3·52	0·17	2·22	·05
Grand Mean	2·79		2·32			

(3) *The structure of the attributes of a plan.*

The 24 items were intercorrelated and a factor analysis carried out by the Varimax method to give a simple structure. Four significant factors were extracted accounting for 45·3 per cent of the total variance. The results of the analysis are presented in Table 3.

TABLE 3

FACTOR ANALYSIS OF 24 ITEMS.

Factor	No.	Item	Loading	Description	Variance
1	3 (g)	ordering subject matter	506	Teaching nexus	
	4 (g)	teaching methods	669		
	5 (s)	materials and resources	668		
	6 (g)	philosophy of subject	215		
	7 (s)	use of teaching time	518		
	9 (g)	subject matter	283		
	10 (s)	criteria for judging	288		
	12 (g)	material and resources	668		
	14 (s)	teaching methods	530		
	16 (s)	ordering subject matter	407		
	19 (s)	philosophy of subject	228		
	20 (g)	use of teaching time	538		
	21 (g)	criteria for judging	332		12·6
2	1 (g)	pupils' interests	–317	Learning situation *versus* pupils' interests	
	2 (s)	subject matter	616		
	3 (g)	ordering subject matter	289		
	7 (s)	use of teaching time	463		
	8 (s)	intended learning	727		
	9 (g)	subject matter	329		
	11 (g)	intended learning	478		
	14 (s)	teaching methods	288		
	15 (s)	knowledge to be achieved	680		
	16 (s)	ordering subject matter	558		
	23 (g)	knowledge to be achieved	301		11·3
3	1 (g)	pupils' interests	302	General purposes of a course	
	6 (g)	philosophy of subject	642		
	11 (g)	intended learning	323		
	12 (g)	materials and resources	239		
	13 (s)	aims	696		
	15 (s)	knowledge to be achieved	314		
	17 (s)	pupils' interest	220		
	19 (s)	philosophy of subject	445		
	21 (g)	criteria for judging	276		
	22 (g)	aims	739		
	23 (g)	knowledge to be achieved	555		10·7
4	1 (g)	pupils' interests	254	Evaluation	
	10 (s)	criteria for judging	504		
	14 (s)	teaching methods	293		
	17 (s)	pupils' interests	497		
	18 (g)	success of similar courses	840		
	19 (s)	philosophy of subject	334		
	21 (g)	criteria for judging	498		
	24 (s)	success of similar courses	845		10

s—statement. g—guides.

The four factors were described as 'Teaching Nexus,' 'Learning Situation *versus* Pupil Interests,' 'General Purposes of a Course' and 'Evaluation.'

The items which loaded most strongly (i.e., above ·3) on the 'Teaching Nexus' factor were both statements and guides concerned with the act of teaching—materials and resources for use in teaching, teaching methods, use of teaching time and the ordering of subject matter for teaching. Items which loaded less strongly (i.e., ·3 or below) were a guide to the subject matter for teaching, and statements and guides to the philosophy of teaching the course and criteria for judging its effectiveness. The loading of these last two items in this area suggests that to some extent teachers are concerned in evaluating their classroom practices, a suggestion which finds support in the observations of Eisner (1967) and Jackson (1968).

Items with strong loadings on the ' Learning Situation *versus* Pupil Interest Factor,' the only bi-polar factor of the four, were both statements and guides to what pupils are intended to learn, the knowledge, principles and skills to be achieved in teaching the course, the subject matter to be taught and how it is to be ordered for teaching as well as a statement of how teaching time is to be used. Items loading less strongly were a statement of the teaching methods to be employed and negatively, the interests and attitudes of pupils. The negative loading of this last item suggests that teachers perceive the tension inherent, though not large, in bringing pupils into contact with the learning they are to pursue through the course of study.

The ' General Purposes of the Course ' factor might equally well be described as a ' Course Rationale ' factor. The items which load on it most strongly—the philosophy behind the subject, the aims of the course and the knowledge to be achieved—provide each in their own way, a justification for the course of study. Items loading less strongly concern both a statement and guide to pupil interests, again a source of justification for a course of study ; and guides to intended pupil learning and criteria for judging the effectiveness of a course. The fact that criteria for judging loads on this factor suggests that for teachers this area is also one where evaluation can take place.

The most strongly loaded items on the ' Evaluation ' factor are the two items concerned with the success of similar courses in the past. Also with strong loading are the items concerning pupil interests and criteria for judging the effectiveness of a course. Two other items, both statements, load on this factor—teaching methods and the philosophy behind teaching the subject.

IV.—DISCUSSION.

The results of this study appear to suggest that teachers' perceptions of the process of planning are dominated by the demand which teaching makes upon them. This demand is governed by the need to have materials and resources and subject matter for teaching, to be aware and take account of pupils' interests and attitudes, to know what one's aims in teaching are, to have a justification for them and to employ a range of criteria for judging the effectiveness of various inter-related activities on which one is engaged when translating the plan of a course into teaching procedures.

A further point arising from this study is the role which the item, pupil interests and attitudes, appears to play in the teachers' perception of the process of curriculum planning. This item loads on factors 1 and 3 as a guide and 4 as a statement but, unlike other items which load on several factors, it does not help to define any particular factor. It may well be that the interests and attitudes of pupils are an element in the process of planning which, though not itself instrumental in defining a part of the process, serves to direct teachers' attention at certain points in the process of planning to an important reference point—the pupils for whom the curriculum is designed. To some extent support for this contention is to be found in the high mean rating given to the item, a guide to the interests and attitudes of pupils.

Finally, the teachers' perceptions of the process of curriculum planning as revealed by this study suggest that teachers perceive the structure of the process in a different way from the way it is seen by the curriculum theorist.

Maguire (1969) has shown that individuals with different roles in relation to the curriculum, teachers and curriculum developers, have different, though related, perceptions of the curriculum planning process, and his work, together with the study reported here, suggests that in building an effective strategy of curriculum development the differences in perceptions will need to be taken into account if confusion and conflict are to be avoided.

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VI.—APPENDIX.

24 ITEMS CONCERNED WITH ATTRIBUTES OF CURRICULUM PLANNING.

A plan should be:

(1) A guide to the interests and attitudes of the pupils for whom the course is designed.

(2) A statement of the subject matter the teacher will teach.

(3) A guide to the ordering of subject matter for teaching.

(4) A guide to the teaching methods which may be employed.

(5) A statement about materials and resources which will be used in teaching.

(6) A guide to the general philosophy behind the teaching of the subject.

(7) A statement of how teaching time will be used.

(8) A statement of what pupils are intended to learn from the course of study.

(9) A guide to the subject matter which may be used in teaching.

(10) A statement of the criteria which will be used in judging the effectiveness of the course.

(11) A guide to what pupils are intended to learn from the course of study.
(12) A guide to the materials and resources which may be used in teaching.
(13) A statement of the aims of the course of study.
(14) A statement of the teaching methods which will be employed.
(15) A statement of the knowledge, principles and skills to be achieved in teaching the course.
(16) A statement of the way in which the subject matter of the course will be ordered for teaching.
(17) A statement of the interests and attitudes of the pupils for whom the course is designed.
(18) A guide to how successful courses of a similar kind have been in the past.
(19) A statement of the general philosophy to be held about teaching the subject.
(20) A guide to how teaching time can be used.
(21) A guide to the criteria which may be used in judging the effectiveness of the course.
(22) A guide to the aims which may be relevant for the course of study.
(23) A guide to the knowledge, principles and skills which may be achieved in teaching the course.
(24) A statement of how successful courses of a similar kind have been in the past.

EFFECTS OF AGE AND INSTRUCTION ON COMBINATORY ABILITY IN CHILDREN

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SUMMARY. The aim of the study was to investigate the effect of direct instruction on the ability to handle permutations and arrangements, as an example of a problem at the level of formal operations. 60 Bucharest school children, 20 aged 10 years, 20 aged 12 and 20 aged 14, tested individually, were first asked to estimate the number of possible permutations with 3, 4 and 5 objects. Results showed that these subjective estimates improved with age, with a threshold (or marked improvement) at age 12, though there was serious underestimating at all ages. A step-by-step teaching strategy using generative 'tree diagrams' was then used. Even the 10-year-olds learned the use of the tree diagrams and the appropriate procedures for permutations and arrangements.

I.—INTRODUCTION.

PREVIOUS studies have demonstrated that children at different age levels can adequately use the concept of probability. According to some authors (Yost *et al.*, 1962; Siegel and McAndrews, 1962; Goldman and Denny, 1963; Davies, 1965; Fischbein *et al.*, 1967, 1969) judgments even in pre-school children may involve the idea of probability (or, at least, of chance). According to other authors (Piaget and Inhelder, 1951; Offenbach, 1964, 1965) the concept of probability can be used only after the age of 7 years; between 7 and 12 years of age it can be used only in concrete situations; later, at the formal-operational stage, it becomes an abstract general strategy (i.e., the capacity to consider all the alternatives conceivable in a given situation). However, in previous papers we reported that the process may be greatly accelerated by systematic instruction (Fischbein *et al.*, 1969, 1970).

We realised, however, that we had to consider also the possibility of developing by instruction the combinatory ability at the formal-operational stage. Piaget and Inhelder's data demonstrate, in fact, only combinatory potentialities in adolescents; the question that concerned us was to find out whether such potentialities could be actualized by specific instruction.

According to Piaget and Inhelder (1951, 1955) the development of combinatory ability can be related to the well-known stages described by their theory: at the pre-operational level, the absence of any systematic strategy which would permit an exhaustive inventory of possibilities; at the concrete-operational level, the search for a system and the acquisition by the child of partial results; and, finally, at the formal-operational level, i.e., after 12 to 13 years of age, the progressive discovery of a strategy.

This conclusion does not exactly fit the facts. Firstly, according to the authors quoted, only some subjects discover at this age the procedure of combinatory construction (1951, p. 183). We do not know what proportion do so, nor what happens with the others. Tasks involving arrangements are not mastered before the age of 13. In the case of permutation, though it seems to be a simpler operation, Piaget and Inhelder (1951, p. 189) showed that subjects did not discover a procedure before the age of 14 or 15. Secondly, the responses obtained by these authors cannot be considered spontaneous (or resulting from the general experience of the child), because their investigatory technique included a certain amount of implicit instruction. (For instance, the subject is successively questioned about the number of permutations obtainable with two, three and four different objects. This gradual amplification is itself instructive). Such analysis suggests two hypotheses : (*a*) at the formal operational stage combinatory ability is still developing, even though, theoretically, formal operations should be regarded as acquired ; (*b*) this process is likely to be accelerated by systematic instruction.

The close connection between combinatory ability and some characteristics of logical thinking—i.e., reversibility, composition, ability to inventory the possibilities in a given situation—has suggested to some authors the use of combinatory activities for testing the intelligence level (Claparède, in Dubosson, 1957 ; Longeot, 1967). The use of combinatory tests at different age levels (Dubosson with ages 5 to 9 and Longeot with 9 to 16-year-olds) showed a tendency for the responses to improve with age. Longeot studied, in addition, the effect of a mathematically mediated instruction, i.e., the effect of learning the cartesian product on solving permutation tests.

The present study was designed mainly to investigate systematically ***the effect of direct instruction*** upon combinatorial ability (arrangements and permutations) in children and adolescents.* Within this context we thought it of interest to examine also the opposite aspect of the phenomenon, i.e., the ***spontaneous subjective estimation*** of the number of permutations possible with three, four and five objects. Naturally, within each experimental session the subjective estimation was tested first, passing on afterwards to the requirement of a systematic inventory based on an explicit strategy.

II.—METHODS AND RESULTS.

Subjects were pupils in the fourth grade (ages 10 : 3 to 11 : 5), sixth grade (ages 12 : 2 to 13 : 4) and eighth grade (ages 14 : 0 to 15 : 2), enrolled in public schools of Bucharest, 20 subjects for each of the three age levels.

The materials consisted of letters and numbers printed on small cards, coloured geometric figures cut out in cardboard (squares, triangles, ellipses).

Within the same experimental session we investigated : (*a*) the subjective estimation of the number of permutations ; (*b*) the acquisition of a systematic strategy in reckoning the number of outcomes (arrangements and permutations). The details of procedure and the results concerning the two aspects investigated will be presented separately. The subjects were tested individually.

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* Our paper is in fact dealing with arrangements with replacement, the formula for which is n^p.

(*a*) *Subjective estimation.*

Procedure. The letters A, B, C were set on the table. By way of example, the child was shown that, by altering the position of the letters, he could obtain various groups (permutations) and he was asked to estimate how many permutations were possible with the three letters, then with the three numbers and three figures. The procedure with four and then with five letters, numbers and figures was the same.

Results. The mean values and the standard deviation of the subjects' responses for letters, numbers and geometrical figures were almost identical. Therefore, Table 1 shows the results with letters only.

TABLE 1

MEANS AND STANDARD DEVIATIONS OF SUBJECTIVE ESTIMATIONS OF NUMBER OF PERMUTATIONS POSSIBLE WITH 3, 4 AND 5 OBJECTS.

Grade	Three letters		Four letters		Five letters	
	M	sd	M	sd	M	sd
IV	4·30	1·95	6·70	3·74	9·10	6·32
VI	5·50	2·09	9·85	4·03	14·65	7·23
VIII	5·30	1·68	9·60	4·36	16·05	8·02

As these responses are to be judged against the correct values obtained by calculations, we present in Table 2 the relative values obtained by dividing the mean values of Table 1 by 6 for P_3, 24 for P_4 and 120 for P_5.

TABLE 2

MEANS AND STANDARD DEVIATIONS OF SUBJECTIVE ESTIMATIONS, RELATIVE VALUES, OF NUMBER OF PERMUTATIONS POSSIBLE WITH 3, 4 AND 5 OBJECTS.

Grade	Three letters		Four letters		Five letters	
	M	sd	M	sd	M	sd
IV	0·71	0·32	0·28	0·16	0·07	0·05
VI	0·91	0·35	0·41	0·17	0·12	0·06
VIII	0·87	0·28	0·40	0·18	0·13	0·06

An analysis of variance was performed with two factors, i.e., age and number of objects (3×3), on the data summarised in Table 2 (with repeated measures on the factor *number of objects*). The category of elements (letters, numbers, figures) was no longer considered in view of the very close values.

The result of this analysis shows that the *age* factor is significant ($F=3{\cdot}89$, $df=2/57$, $P<0{\cdot}05$) and that the number-of-elements factor is highly significant ($F=268{\cdot}80$, $df=2/114$, $P<0{\cdot}001$). The interaction is not significant.

Inspection of the data led us to the following findings: there is a general tendency towards ***under-rating the number of possible permutations. The under-rating is more significant the larger the number of objects considered.*** While for P_3 the values indicated by subjects are as high as 80–90 per cent of the correct number, for P_5 the under-rating is striking. While there is improvement with age, in fact only the age of 12 years (6th grade) represents an evident threshold. Thus, on testing the significance of the discrepancy in mean values obtained in fourth- and sixth-graders (data in Table 1) we obtain: for P_3, $t=1{\cdot}93$, $P\simeq 0{\cdot}05$; for P_4, $t=2{\cdot}76$, $P<0{\cdot}01$; for P_5, $t=4{\cdot}86$, $P<0{\cdot}001$. On comparing the sixth- with the eighth-graders we did not note any significant difference for P_3 and P_4. For P_5 $t=1{\cdot}86$, P just short of 0·05. For P_5 there was an improvement even from age 12 to age 14, which was not the case with either P_3 or P_4. It is thus reasonable to assume that age differences become wider as the number of objects considered increases.

(*b*) *The effects of instruction.*

Two guiding principles were followed in the design of this stage of the experiment session:

(*a*) We felt that some techniques of programmed instruction might be combined with some of learning by discovery; we thus devised a procedure which we termed ***instruction by programmed discovery.*** The whole process of instruction was divided into sequences according to the following criteria: (i) each sequence started with a question which it was possible for the subject to answer by himself, and this enabled him to solve by himself all the subsequent elements of the sequence; (ii) after solving a sequence, the subject became able to solve the next one by transfer and generalisation.

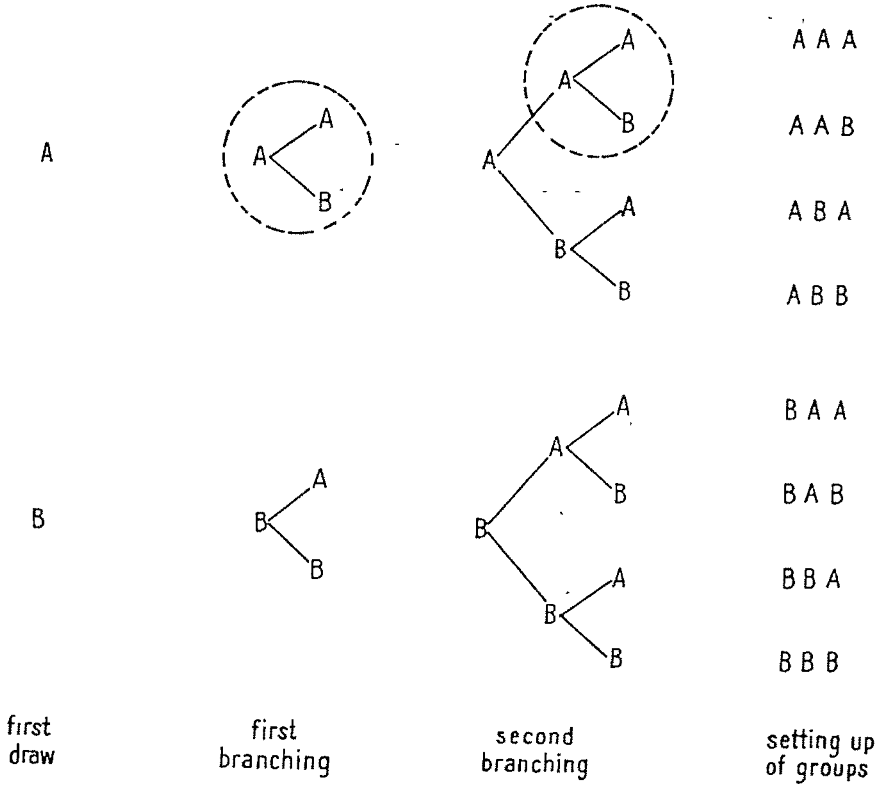
(*b*) In a previous paper we formulated the following hypothesis: by learning a concept the pupil builds a variety of diagrammatic models which are implicit, in that they escape conscious check-up by the conceptual network. Such implicit figural patterns may become a source of errors. It is desirable, therefore, that the process should be systematically guided by the teacher so that the pattern established should be correct and should lend itself to conscious control and handling. In fact, such a model may be considered a generative one, in view of its self-proliferating property. The figural pattern used in this experiment was that of tree diagrams currently used in probability reasoning

Procedure. Arrangements of two different objects in groups of three. The letters A and B were introduced into a small opaque bag. S was asked to draw from it three times, ***replacing each time the previously drawn letter,*** and to write down the group obtained. E: " How many such groups, different from one another, may be obtained ?" After S had answered he was asked to write down the groups he expected to draw from the bag. E: "Couldn't we find out all the possible groups more easily, I mean by a method? Go ahead, try !" E: "Which is the letter that you expect to draw first ? " If S fails to answer, E indicates the response: " Either A or B." Next, we proceeded in the same way with the second draw, obtaining in this way two-letter groups that S had to read. E: " Let's think further; let's draw the third time."

We thus obtained the sequences shown in Figure 1.

FIGURE 1

STEPS IN LEARNING ARRANGEMENTS OF TWO LETTERS IN GROUPS OF THREE.



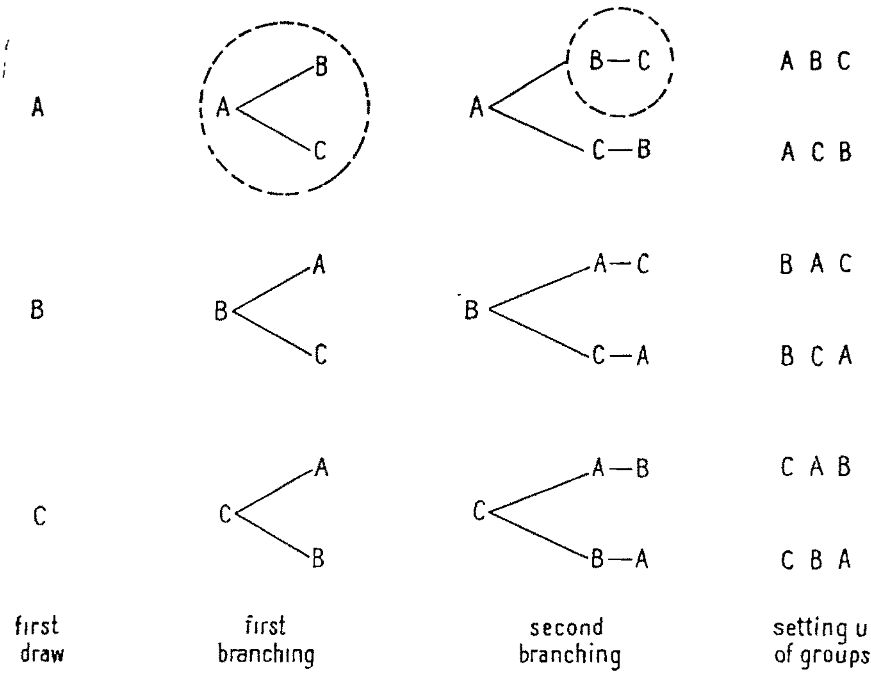
The dotted circles are what might be called the *nodal moments* of the process. These nodal moments actually mark the steps of understanding. Each moment is indicated by a question designed to arouse, by a limited generalisation, the leap toward the succeeding step in the process of constructive thinking. After building the diagram S has to interpret it, writing down the groups obtained. The last questions are designed to guide S to the computing formula. E: "Couldn't we get this result by a simple computation? Let's examine the diagram." When S fails to pass directly from the diagram to computation, he is reminded of the principle of construction: "We had two alternatives at first. Either was followed by two more and so forth . . ."

Arrangements of two different objects in groups of four. The subject was asked *to compute* the number of possibilities in arranging two objects in groups of four *without turning to the diagram.* If he failed, he was asked to build first the diagram from which he was then to infer the solution.

Permutations. The letters, A, B, C were put in the bag and mixed and the subject was asked to draw one letter at a time *without putting back the preceding one*. The subject, who already knew the term *permutation* from the beginning of the session (subjective estimations), wrote down the groups thus formed. He was asked to write also the groups he expected to draw. Next, he was asked to use, as in the previous task, a method. In principle, the instructional technique used by the experimenter was the same as that previously used with arrangements. The diagram-construction steps are shown in Figure 2.

FIGURE 2

STEPS IN LEARNING PERMUTATIONS OF THREE LETTERS.



After the diagram was built, the subject was asked to determine the value of P_3 by computation. Subsequently he had to compute the P_4. If he failed he was asked to build the diagram first, computing afterwards. The final question required computation of P_5. The basic idea of the instructional procedure is that a proper alternation between diagrammatic intuitive techniques and abstract synthesizing concepts stimulates the pupil's mental activities and thereby leads to structural acquisitions.

TABLE 3

SUCCESSES IN ARRANGEMENTS OF TWO LETTERS IN GROUPS OF THREE AND FOUR.

S : number of subjects solving unassisted.
S+E : number of subjects solving with minimum hints from experimenter.
E : solution indicated by experimenter.
* : hints necessary only for diagram construction.
** : hints necessary only for computation.

Grade	Arrangements of two letters in groups of three								
	Diagram Construction						Computation		
	First branching		Second branching		Setting up of groups		Solution by computation		
	S	E	S	E	S	S+E	S	S+E	E
IV	$2_{(10)}$	$18_{(90)}$	$7_{(35)}$	$13_{(65)}$	$13_{(65)}$	$7_{(35)}$	$9_{(45)}$	$10_{(50)}$	$1_{(5)}$
VI	$0_{(0)}$	$20_{(100)}$	$13_{(65)}$	$7_{(35)}$	$18_{(90)}$	$2_{(10)}$	$8_{(40)}$	$8_{(40)}$	$4_{(20)}$
VIII	$7_{(35)}$	$13_{(65)}$	$14_{(70)}$	$6_{(30)}$	$16_{(80)}$	$4_{(20)}$	$12_{(60)}$	$7_{(35)}$	$1_{(5)}$

	Arrangements of two letters in groups of four					
Grade	I Computation II Diagram		I Diagram II Computation		Failure	
	S	S+E*	S	S+E**	Computation	Diagram
IV	$15_{(75)}$	$2_{(10)}$	$1_{(5)}$	$1_{(5)}$	$1_{(5)}$	—
VI	$17_{(85)}$	—	$1_{(5)}$	$1_{(5)}$	—	$1_{(5)}$
VIII	$19_{(95)}$	—	—	$1_{(5)}$	—	—

TABLE 4

SUCCESSES IN PERMUTATIONS OF THREE, FOUR AND FIVE LETTERS AFTER LEARNING OF ARRANGEMENTS.

Grade	Permutations of three letters							
	First branching		Second branching		Setting up of groups	Solving by computation		
	S	S+E	S	S+E	S	S	S+E	E
IV	$17_{(85)}$	$3_{(15)}$	$16_{(80)}$	$4_{(20)}$	$20_{(100)}$	$14_{(70)}$	$1_{(5)}$	$5_{(25)}$
VI	$15_{(75)}$	$5_{(25)}$	$15_{(75)}$	$5_{(25)}$	$20_{(100)}$	$17_{(85)}$	$2_{(10)}$	$1_{(5)}$
VIII	$18_{(90)}$	$2_{(10)}$	$15_{(75)}$	$5_{(25)}$	$20_{(100)}$	$19_{(95)}$	—	$1_{(5)}$

	Permutations of four letters								
	I Computation II Diagram			I Diagram II Computation			Knows only		Knows nothing
	S	S+E*	S+E**	S	S+E*	S+E**	Computation	Diagram	
IV	$12_{(60)}$	$1_{(5)}$	—	$2_{(10)}$	—	$1_{(5)}$	$2_{(10)}$	—	$2_{(10)}$
VI	$12_{(60)}$	—	$1_{(5)}$	$2_{(10)}$	—	$2_{(10)}$	$1_{(5)}$	—	$2_{(10)}$
VIII	$12_{(60)}$	$1_{(5)}$	—	$4_{(20)}$	$1_{(5)}$	—	—	$1_{(5)}$	$1_{(5)}$

	Permutations of five letters Computation	
	Correct	Wrong
IV	$16_{(80)}$	$4_{(20)}$
VI..	$17_{(85)}$	$3_{(15)}$
VIII	$18_{(90)}$	$2_{(10)}$

*(Same legend as in Table 3: percentages in brackets).

Results. The results are summarised in Table 3 (arrangements) and 4 (permutations).

On the basis of the data set out in Tables 3 and 4 the following can be stated:

(*a*) Pupils assimilate the model of the tree diagram during the first phase of the experimental session (arrangement of two different letters in groups of three). An improvement is to be noted, from sequence to sequence, for each of the three age levels, which confirms the principal effect pursued by the learning-by-discovery method, i.e., *the ability to transfer by generalisation the previously acquired skills.*

(*b*) The solving by computation (2×2×2), however, appears spontaneously only in few subjects after the first diagram has been drawn. Even among eighth-graders, those spontaneously transposing the diagram into a numerical operation numbered 12 out of 20 (60 per cent).

(*c*) The progress achieved during the first phase of the session proves to be a structural one, as in passing from groups of three to groups of four letters the majority of the subjects succeed in performing the computation and building the diagram unassisted.

(*d*) Passing on to permutations of three letters (Table 4) we find, this time, that around 80 per cent of the subjects can build the diagram unassisted, which may denote the effect of a remote transfer.

(*e*) As may be seen from Table 4, it is only among fourth-graders that those who discover the computational solution ($P_3=1\times2\times3$) are fewer than those who build the diagram (70 per cent against 85 per cent). Among sixth- and eighth-graders, the number of those who discover the computational way of solving without any assistance exceeds the rest (amounting to 95 per cent in eighth-graders).

(*f*) Permutations with four letters: at this phase of the session, from the outset we asked the subjects to solve the task by extension of the previously used computational procedure (passing from 1 . 2 . 3 to 1 . 2 . 3 . 4) and to build the diagram by themselves. Subjects who failed to do the computation were asked to build the diagram first. In order to find out the number of subjects who had succeeded in building the diagram by themselves, we added up the two columns of correct answers for P_4 (Table 4) (I computation, II diagram; I diagram, II computation). We thus obtained 70 per cent, 70 per cent and 80 per cent for the three age levels considered, of which 60 per cent only, at each age level, performed the computation unassisted from the outset. But going also through this phase of the session greatly consolidates the understanding of the computational formula (n !), as is shown by the P_5 column of correct unassisted answers, i.e., 80 per cent, 85 per cent and 90 per cent for the three age levels, respectively.

We point out the fact that in practice it proved a much easier task for the subjects to pass to the computational formula n (n–1) (n–2) . . .—in fact the one we used with them—than to 1 . 2 . 3 . . . n.

(*g*) The vertical comparisons among the three age levels indicate generally a progressive improvement of responses with age. Such improvement, however, is far from being as spectacular as it should have been according to the Piaget-Inhelder concept of intellectual development by stages. *It was only in the first phase of the session that the discrepancies were striking.* The differences diminished during the instructional session.

III.—DISCUSSION.

1. As shown by the data on subjective estimation of the permutations, included in Table 1, the mean values for the estimations (and, as a matter of fact, the standard deviations, too) made by the 12- to 15-year-old subjects are surprisingly close. In so far as these estimations are not, at least apparently, based on any exhaustive inventorying strategy and do not rely on any direct preceding experience, the responses may be assumed to be 'blind,' that is, given absolutely casually and thus unable to express anything significant. The fact that for tasks using three and four elements the mean values obtained for subjects at different age levels were almost equivalent and that for tasks using five elements the mean values were so close, points, we believe, to the existence of a covert mechanism of estimation of the permutations which determines a statistically stable resultant beyond the aleatory influences and, within certain limits, even beyond the age factor.

What this mechanism consists of and how it operates we do not know, but it must be assumed to be intimately interlocked with the dynamics of plausible reasoning, in fact with the dynamics of productive thinking. Marcel Dumont said, in this connection: " The fact must be recognized that if a fair proportion of people can write and if they know, more or less, the four elementary operations with the natural integers, the majority are absolutely perplexed before a plain combinatorial problem, confused by a kind of computation that they have not been trained for. And as this is precisely the sort of problem which comes up whenever we are to consider one eventuality among others, in other words, at every moment of life as a matter of fact, the majority turn to ' chance ', a more or less metaphor-laden chance."

What our findings show, in addition, is the fact that actually the relative chance is to a certain extent controlled by a mechanism of evaluation which, however, leads to a striking ***under-rating of the number of possibilities***, an under-rating that is the more striking the larger the number of alternatives. It may be inferred from this that our judgments involving estimations of possible combinations (and this is, as Dumont states, always the case) will be biased by a strong tendency to under-rate the gamut of alternatives involved.

2. The differences due to age are evident with subjective estimations and at the first stage of the instruction. In this situation it is possible to speak of thresholds, of *leaps* that spectacularly fit the stages indicated by Piaget. *Instruction, however, reduces these differences.* Even though not inducing a complete levelling, instruction diminishes the differences in such a degree that all that remains is but a slightly upward curve. Hence, a first inference that seems to be basic to the whole problem of intellectual development: the effect of stage differences is partly counterbalanced by the higher receptivity of younger subjects, at least for some patterns of activity.

As far as combinatory ability is concerned, a well-conducted instruction may determine structural acquisitions, the efficiency of which is demonstrable by the remote transfer effects we have ourselves ascertained.

In the previously quoted paper Dumont made also the following remark: " Until we get more evidence on the way intelligence is operating, imagination may be considered as an unconscious mechanism of combination ('une combinatoire '), on the level of recollection, viz., recollections of activities, or more or less elaborate concepts. Imagination presupposes a great mobility and a considerable flexibility in exploring the field of memory " (Dumont, p. 57).

According to Dumont, the inclusion in school instruction of educational games stimulating combinatory activities may contribute to developing the imagination (and thus the intelligence too), a point too frequently overlooked by scientific education nowadays.

Our findings suggest, we hope, something more: the possibility for the child to attain *systematically, yet at the concrete operational stage, a body of knowledge and mental skills and intuitions concerning combinatory analysis.*

Associated with concepts of statistics and probability these might contribute substantially to the development of the pupil's scientific thinking and imagination.

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EVALUATION OF A CURRICULUM

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SUMMARY. This is an exploratory attempt to evaluate Nuffield Science courses, adapted for use in third forms in New Zealand schools. Course objectives were identified and growth in these objectives was determined between February, 1967, and February, 1968. In addition, shifts in pupil interest in science and changes in the teachers' behaviour were measured. Where data were unambiguously collected and analysed it would appear that genuine growth in the objectives of the courses did indeed occur.

I.—INTRODUCTION.

A review of the literature from Judd (1922) to Ausubel (1968) indicates that there have been very few genuinely impartial evaluations of new educational courses. Rarely have measurable objectives been identified and tested in any kind of randomised setting. Many writers in the past decade have bemoaned the usual ' developmental ' approach associated with the idea that if much time and money have been devoted to preparing a course, it must be worthy. Where enthusiasts try out new courses and provide feedback for modification, consequent assessments have perhaps been little more than descriptions of Hawthorne effects (Watson, 1962). It has been argued that a better approach is possible (Kerr, 1966 ; Ausubel, 1968 ; Harvard Project Physics, 1968-69) and there is now a growing number of evaluations based on experimental techniques (S.M.S.G., 1962 ; Friskopp, 1967 ; Wallace, 1963 ; Heath, 1963 ; Atwood, 1968). Some new curricula have been associated with public examinations and the results analysed and published (Nuffield Biology Project, 1963 and 1966 ; Mathews, 1967). Evaluations of film courses have also been reported, in particular by Watson (1964). Currently, the Harvard Project Physics is using research techniques to evaluate its course in terms of at least 10 variables (Harvard Project Physics, 1968-69).

Lindvall (1966) concludes that evaluation efforts for the immediate future would be most fruitful in terms of : " Does this innovation do what is desired ? " The present investigation attempts to answer a similar question for Nuffield science courses modified for New Zealand conditions, namely : *Do the courses lead to achievement in their own stated objectives ?*

II.—PLAN OF THE EVALUATION.

Subjects.

The pupils involved in the evaluation were all attending schools in Auckland, a New Zealand city with a greater urban population of 500,000. The sample consisted of 837 pupils from 10 schools. All pupils were academically in the upper third of the school population (the three top streams in each school). The experimental group consisted of four state co-educational schools and one independent boys' school and the comparison group was made up of five state schools—three co-educational and two boys'. All teachers in both groups were science graduates with experience ranging from 1 year to 48 years, with a median value of 10·1 years of service. Table 1 sets out the details of pupils and teachers in the two groups.

TABLE 1

PUPILS AND TEACHERS.

	Experimental Schools (E)	Comparison Schools (C)
Group numbers: Boys	247	279
Girls	171	140
Total	418	419
Mean age, in years, of pupils at entry (February, 1967)	13·1	13·1
Mean IQ	112	117
Mean socio-economic rating (scale 1 to 7; 7 high)	3·4	3·1
Teacher—experience: mean years of service	9·9	10·2

The socio-economic scale used was developed for New Zealand conditions by Robert J. Havighurst, in 1954.

Experimental Design.

The 10 schools were selected on the basis of the interest of the teachers in the kind of science learning associated with the Nuffield Project. After this selection, five schools were unable to undertake the experimental programme for administrative, financial and other reasons not connected with the experiment. Although a control group was not essential to the experiment (as growth was to be measured in terms of the stated Nuffield objectives), the investigators felt that, as all teachers claimed to be working towards similar objectives, it would be valuable to retain the five schools as a comparison group. The schools accepted this arrangement and agreed to administer the necessary tests.

The Nuffield Science materials were not regarded as popular in the district and it is believed that no Hawthorne effect developed in the experimental schools through the influence of forces outside the classroom. The teachers involved were businesslike and neutral, withholding judgment, rather than enthusiastic and ' sold on ' the courses.

The plan included the measurement of cognitive skills, attitudes and interest in science. Since evaluation was concerned with growth towards achievement in some of the objectives of the Nuffield Project, gain-scores were needed and a pre-test and interest questionnaire were set before the pupils began any secondary school science. The plan also called for self-evaluation of changes in teacher-behaviour.

The major statistical tools used were Pearson product-moment correlations, analysis of variance and analysis of co-variance.

The Adapted Nuffield Courses.

The following Nuffield courses were used: Physics, Year I; Chemistry, Stage 1A; Biology, Year 3. As New Zealand schools allocate less time to third form science than that required for the three Nuffield courses, it was necessary to omit some experiments and topics in physics and chemistry, while preserving the original order of the remaining topics. In biology, the first part of Year 3 was used in full as the year's programme. The adapted physics course covered basic concepts about materials, measurement, elastic properties, pressure, kinetic theory and molecules, and energy transfer. The chemistry course used the first eight topics of Stage IA, *Exploration of Materials*, and included work on effects of heat, air, burning, the elements and competition among the elements. The biology course, *Maintenance of Life*, included exchange of gases in organisms, breathing, obtaining energy and food and life.

Nuffield Objectives.

The literature of the Nuffield Science Teaching Project was combed in order to identify the objectives of the Nuffield courses (Nuffield Science Teaching Project, 1965a, 1965b, 1966, 1967, 1968 ; Head, 1965 and 1966 ; Mathews, 1967 ; Boulind, 1968 ; Nyholm, 1968 ; Lister, 1969). Close to 100 behaviourally stated objectives were listed, and of those 70 matched one or other of those attributed to the courses by the present investigators. The remaining statements were concerned either with recall or laboratory skills. It appears that the following abilities and attitudes measured are appropriate and that pupil-growth in these is anticipated by the authors of the Nuffield programmes.

Abilities and Attitudes Measured.

Cognitive categories.	*Criteria for marking schedule.*
Analysis and interpretation of data.	Pupil judges relevancy of data. Pupil recognises trends. Pupil reasons logically from data.
Extrapolation.	Pupil argues cautiously beyond the presented data.
Formulation of hypotheses, generalisations or explanations.	Pupil forms hypothesis, generalisation or explanation which can be tested. Pupil points up ways in which the hypothesis can be tested.
Ability to devise experiments to test hypotheses.	Pupil shows what evidence is needed. Pupil outlines procedures for collecting the evidence.
Attitudes.	
Intellectual honesty.	Pupil gives his reasoning even though it seems contrary to the accepted. Pupil willing to acknowledge ignorance.
Open-mindedness.	Pupil willing to abandon pre-determined ideas. Pupil accepts good evidence without arguing.
Critical-mindedness.	Pupil requests source of information. Pupil questions authority. Pupil questions validity of the information given.

Tests Used.

Examination of many existing science tests showed that they were measuring mainly recall and ability at very simple cognitive tasks, in spite of claims that they were testing for understanding and more complex achievements. It was decided that instruments would have to be developed for the evaluation. Simplicity and validity were aimed at with the hope that more sophisticated instruments would be developed in due course.

The pre-test for cognitive ability was adapted from questions in an exploratory examination set by the Secondary School Examinations Council (1964) for the Certificate of Secondary Education. Questions were of the structured free-response type and called for a display of the cognitive skills listed above but no display of learned content. The content of the questions was independent of anything learned by the pupils in their courses, and was almost certainly new to every pupil taking the tests. In this way the questions were the same for both groups.

The post-test was almost precisely matched to the pre-test in every respect except actual content. The following matched pair of questions illustrates those used in the two tests. The questions were marked for the abilities to analyse data and formulate hypotheses, part (*a*), and the ability to devise experiments to test hypotheses, part (b). There were four questions in each test.

Pre-test: Question 1. A village church which is built of grey limestone, is in good preservation and the stone is unweathered. In a neighbouring town, where there are steelworks and mines, the same stone has been used in some of the older buildings, but it has weathered badly. Alternative explanations have been put forward to account for the weathering. Some of these are:

(i) It is caused by rain.
(ii) It is caused by soot.
(iii) It is caused by wind.
(iv) It is caused by acid fumes.

(*a*) Very briefly discuss each possibility and then suggest what you think is the most likely explanation.

(*b*) How could you test the truth of your explanation?

Post-test: Question 1. The two Northbound lanes of a bridge are paved with the same surface material. The surface of the left-hand lane, nearest the edge of the bridge, is beginning to become worn and pitted. The right-hand Northbound lane shows few signs of wear. Alternative explanations have been put forward to account for the wear. Some of these are:

(i) It is caused by exhaust fumes.
(ii) It is caused by engine oil.
(iii) It is caused by the weight of traffic.
(iv) It is caused by the speed of the traffic.

(*a*) Very briefly discuss each possibility and then suggest what you think is the most likely explanation.

(*b*) How could you test the truth of your explanation?

Attitudes were scored tangentially from the written responses to the cognitive tests. During a pilot study prior to the main experiment, a significant number of responses showed evidence of attitudes satisfying the criteria listed above.

After the responses had been assessed, an attitude marking-schedule was developed.

Each skill or attitude was scored on a three-point scale (0, 1, 2) and mean scores converted to percentages for the analysis of data.

The interest questionnaire required only short free-response answers. Again, each response was marked on a three-point scale according to stated criteria and mean-scores converted to percentages.

Interest Questionnaire.

1. What out-of-school interests do you have in science?
2. What are your favourite school subjects?
   Why are they your favourites?
3. Are there any science questions that you have wanted to find answers to? State what they are if there are any.
4. What books on science can you remember reading?
5. What parts of your schoolwork in science have you found interesting?

In addition to the measures described above, the teachers of the experimental classes were asked to report on their own behaviour changes during the period of the experiment. In the following continuum the behaviours are arranged from teacher-centred to enquiry-centred. Teachers were asked to indicate with a letter code (for example, A to C) the shift they believed had occurred in their own behaviour during the period of the experiment.

A Mainly tell and do.

B Mainly questioning by the teacher.

C Some discussion and some questioning by the teacher.

D Often full discussion.

E Sometimes following up pupil suggestions and ideas.

Pupil and Teacher Comment on the Test Instruments.

Pupil and teacher comments were received on all tests. Many suggested the time allocation was too generous (one hour and 20 minutes, respectively, for research tests and interest questionnaire). However, the investigators believe that as the instruments were conceived as power tests the time allocation was satisfactory. It was generally accepted by teachers and pupils that the tests demanded ' thinking ' and in many instances it was reported that pupils regarded the tests as a challenge. The language of the tests was thought appropriate, although for the pre-test some teachers and pupils felt that the terms ' deduce,' ' conclusion ' and ' explanation ' were difficult to interpret. The investigators are content that the pupils did comprehend the questions, i.e., there was clear evidence in the responses that the meaning of the questions had been conveyed. An early marking category—comprehension—was abandoned at the pilot study stage.

TABLE 2

TWO-DIMENSIONAL GRID OF PRE-TEST AND POST-TEST.

	Questions	1	2	3	4	Total
Cognitive categories (total out of 32).	Analysis	2	2	2	–	6
	Extrapolation	–	2	2	–	4
	Hypothesis formation	2	4	6	6	18
	Ability to devise experiments	2	–	–	2	4
Attitudes (total out of 10)	Intellectual honesty	2	–	–	–	2
	Open mindedness	2	–	–	–	2
	Critical mindedness	2	–	4	–	6

Table 2 shows the objectives measured and the marks awarded in the four structured free-response questions in each of the research tests.

Marker Reliability.

Tests for marker reliability were applied separately to the cognitive totals and attitude totals. Approximately 100 scripts were selected at random for each test and scored independently by each of the markers.

TABLE 3

MARKER INTER-CORRELATIONS.

	A*v*B	A*v*C	B*v*C
Pre-test (Cognitive)	0·96	0·76	0·88
(Attitude)	0·48	0·66	0·50
Post-test (Cognitive)	0·72		
(Attitude)	0·54		

Intercorrelations of the markers scores for the separate cognitive categories showed coefficients close to those given above for total cognitive scores. Although intercorrelations for attitudes were lower, it was felt, that, in view of the experimental nature of measurements and values obtained by others testing attitudes, the correlations were probably high enough to detect significant differences between large groups.

Test Reliability.

A pilot study in an intermediate school established the reliability of the research tests. The 72 pupils of two top form II classes were paired on the basis of their IQs and socio-economic ratings and a blocking technique used by assigning the pre-test and post-test at random to the pairs. Reliability of the two papers, as given by the correlation coefficient of the standard scores of the two groups, was 0·89.

III.—RESULTS.

COGNITIVE MEASURES.

Throughout the following results, pre-test, post-test and gain-scores are expressed as percentages.

TABLE 4

EXPERIMENTAL AND COMPARISON GROUPS.

	Group	Mean Score	sd	t	P
Pre-test	E	36·1	15·2	2·08	·05 (of difference)
	C	38·3	15·6		
Post-test	E	44·2	12·8	2·5	·015 (of difference)
	C	42·0	13·0		
Gain-score	E	8·1	15·1	7·8	·001
	C	3·7	17·0	3·5	·01
Difference in Gain-score		4·4		>4	·001

$N_E=418$ (mean IQ=112); $N_C=419$ (mean IQ=117)

Table 4 sets out the mean scores for each group on the cognitive pre-test, the post-test, the gain scores and the differences in gain scores. The results of the t tests applied are presented on the right-hand side of the table. From these results it can be seen that the experimental group, starting from a lower pre-test mean, increased its score by 8·1 per cent to surpass the post-test mean of the comparison group.

TABLE 5

SUMMARY OF NUMBER OF CLASSES SHOWING SIGNIFICANT GROWTH.

Level of significance	·001	·01 to ·05	Not significant	N
E	8	3	4	15
C	1	6	8	15

The results displayed in Table 4 are corroborated by those in Table 5 which shows the number of classes which showed gains on the cognitive tests at each of three levels of significance.

Results Based on Adjusted Scores.

Because of the difference in pre-test scores on the cognitive test, the results were adjusted by covariant analysis for both individual scores and class means. Pre-test scores were used as the independent variable and gain-scores as the covariate. Table 6 sets out the results of this analysis for individual scores. The table further supports the conclusion that the pupils of the experimental group showed significantly more growth on the objectives measured. For the experimental group there were no significant differences between the gains for streams. However, the top and middle streams in the comparison group gained significantly more than the bottom stream. Boys and girls showed similar gains in the experimental group, but for the comparison group the girls gained markedly more than the boys.

TABLE 6

Results Based on Adjustment of Individual Scores.

Difference between gain-score means for :	Group	df	F	P
Groups ($M_E > M_C$)	E and C	1,834	25	·005
Streams (Stream 1 and 2 means greater than stream 3 mean)	E	1,414	2·03	—
	C	1,415	58	·001
Sex (Girls' mean greater than boys' mean)	E	414	<1	—
	C	415	18·4	·001

Table 7 sets out the adjusted gain-scores means for classes in the two groups. All gain-scores have been adjusted after covariant analysis using class pre-test means and class gain-score means. The table shows that 11 out of the 15 experimental classes improved their cognitive test score by more than 5 points, compared with only 4 of the 15 comparison classes. The group gain-score means based on classes were significantly different at the ·01 level ($M_E = 7 \cdot 4$; $M_C = 4 \cdot 5$).

TABLE 7

Gain-scores on Cognitive Tests for the 15 Classes in each Group.

Experimental					Comparison				
Class	N	IQ	S-Es*	Gain Score	Class	N	IQ	S-Es*	Gain Score
A1	32	120	3·7	10·0	V1	36	119	3·3	1·0
A2	31	106	3·2	8·0	V2	29	111	2·7	1·0
A3	26	99	3·6	7·5	V3	22	108	2·8	5·0
B1	29	118	3·2	2·5	W1	31	124	3·3	9·0
B2	25	104	3·1	5·5	W2	28	120	3·0	7·5
B3	28	101	2·9	10·0	W3	23	116	2·9	2·0
C1	28	124	3·4	10·0	X1	22	120	3·0	13·0
C2	28	114	3·4	4·5	X2	27	112	2·7	9·0
C3	30	108	3·4	10·0	X3	29	113	3·0	4·5
D1	33	123	3·0	11·0	Y1	30	126	3·3	1·0
D2	28	113	3·0	4·5	Y2	26	117	2·9	1·0
D3	31	110	2·9	9·0	Y3	32	115	2·9	4·0
E1	25	117	4·8	8·0	Z1	27	123	4·0	4·5
E2	24	113	4·0	7·5	Z2	29	118	4·1	5·0
E3	20	107	3·6	4·0	Z3	28	109	2·9	0·5

* Socio-economic ratings.

Table 8 shows that the significant gains made by the experimental group were largely confined to those parts of the tests concerned with hypotheses and experiments. This is not surprising in view of the emphasis placed on these abilities in the Nuffield courses used.

TABLE 8

GAIN-SCORES IN COGNITIVE CATEGORIES.

	Number of Schools Showing Gains		Number of Classes Showing Gains		Difference in Gain Scores *	P
	E	C	E	C		
Analysis	2	1	5	5	—	—
Extrapolation	2	2	8	6	—	—
Hypotheses	5	2	10	8	5	·01
Experiments	3	3	5	3	3	·05

* Difference between group gain-score means based on classes.

AFFECTIVE MEASURES.

Attitudes: In the following results, expressed as percentages, it was found unnecessary to adjust raw scores because of the closeness of the pre-test means for the two groups.

TABLE 9

MEAN ATTITUDE SCORES AND SIGNIFICANCE OF CHANGES FOR EXPERIMENTAL AND COMPARISON CLASSES.

Group	Pre-test Mean	Post-test Mean	Gain-Score Mean	Gain-Score sd	t	df	P
E	12·4	19·7	7·3	7·6	3·6	14	·01
C	11·3	16·3	5·0	7·9	2·45	14	·05

Table 9 shows that there were significant gains in attitude scores in both groups with experimental classes showing greater gains. Again, boys and girls showed the same gains in the experimental classes, whereas girls showed significantly greater gains than boys in the comparison classes.

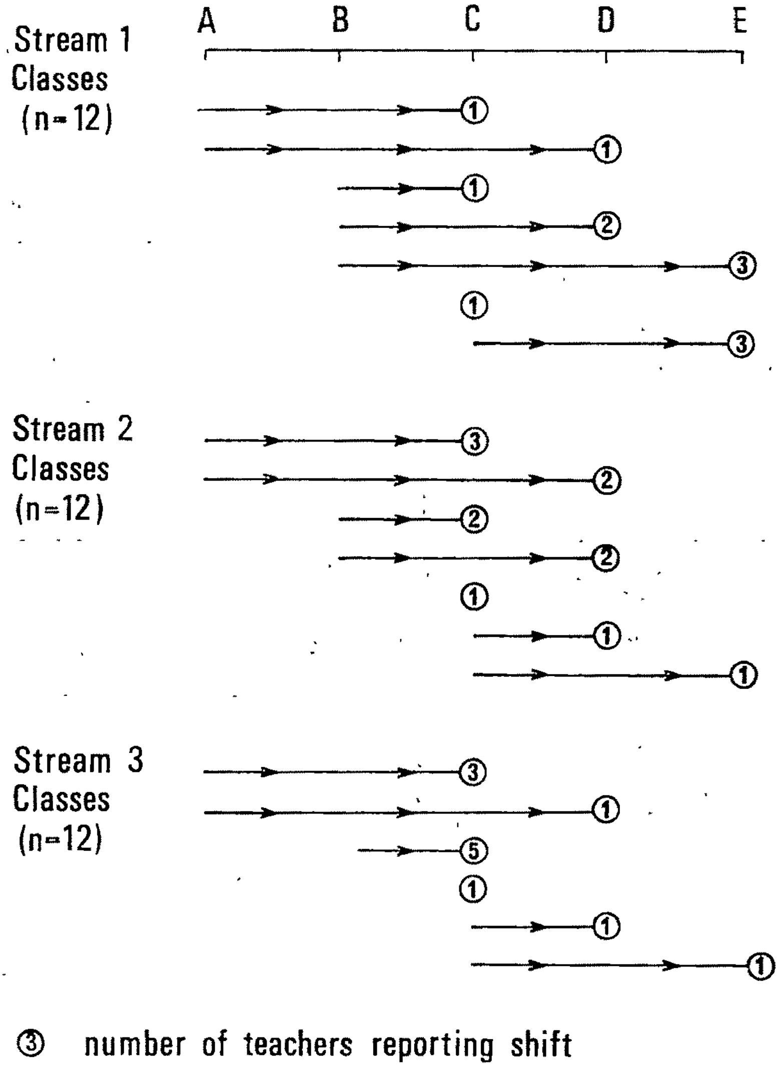
Interest: The pre-test means and gain-scores, together with the pattern of responses to individual questions revealed no significant differences in interest between the two groups. Both groups showed losses in out-of-school interest in science. However, in both pre-test and post-test, a higher proportion of pupils in the experimental schools listed science as their favourite school subject. In neither population was there clear evidence that pupils wished to ask additional questions in science—some evidence in 1967 had fallen markedly by 1968. Evidence of books read in science showed some increase in the comparison schools, but again, overall, there was no significant difference between the reading habits of the two groups.

TEACHER SELF-EVALUATION (Experimental group only).

Figure 1 illustrates what teachers decided, after reflection, were the main changes in their own approach to teaching. These results were provided anonymously to the investigators and strongly suggest that the Nuffield materials provided a good training ground for teachers of Nuffield courses.

Fig. 1

SHIFTS IN TEACHER-BEHAVIOUR



The shifts were all towards the 'discussion—pupil enquiry' end of the continuum displayed under *Tests Used*. The mean shift in teacher behaviour was two steps along the continuum. There is no reason to suppose that the teachers were not honestly reporting what they thought to be changes in their behaviour. It is concluded that these measurements are valid and important.

IV.—CONCLUSION.

The sample of 837 children who took the pre-test and post-test gained significantly at greater than the ·001 level. It is considered that this represents actual growth in the objectives measured. When the sample was divided into two groups, the experimental group (N=418) showed significantly more growth than the comparison group (N=419) at the ·001 level. Moreover, the gains in the comparison group arose largely from two schools, one of which included quite a flavour of Nuffield Science in its courses, while the other is believed to have misunderstood the testing procedures on the post-test and inadvertently given help to at least one of the three classes. For the experimental group, the hypothesis that: "Modified Nuffield courses do not lead to achievement in the objectives of the Nuffield courses," must be rejected at the ·001 level.

It is possible that a Hawthorne effect was at work among experimental schools. Although pupils in both groups experienced change in moving from primary to secondary schools, the pupils in the experimental classes did have the added novelty of an unfamiliar type of learning. The investigators do not think there was a marked effect due to novelty, but are prepared to allow that the team-working of the teachers in the experimental schools could have been more important than the course materials.

The investigators hope that better designs will be used in the future for evaluating important courses. It is accepted that, for evaluations of the type used here, replication is essential before generalisations can be taken seriously. More reliable tests are also needed, and to this end attempts are being made to design objective marking schedules for the research tests used in this evaluation.

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CREATIVE ACTIVITIES AND 'PEAK' EXPERIENCES

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SUMMARY. 400 sixth-form and undergraduate respondents to a questionnaire were asked to write about any experiences they had had which they felt were similar to ones quoted from an autobiography in the questionnaire. This autobiographical passage described experiences in childhood of ecstatic joy in nature, turning sometimes to awe and fear. 55 per cent responded to this question. In this paper no attempt is made to classify or describe the variety of experiences reported by the respondents : only some differences between the two groups of respondents, those describing experiences of some kind and those not doing so, are presented. In particular, attention is given to a significant correlation between those describing such experiences and those expressing active interest in creative writing, painting, music and reading poetry. The respondents admitting to such creative artistic interests are further compared with those not doing so.

I.—INTRODUCTION : OUTLINE OF INVESTIGATION.

THE findings reported here are based on a questionnaire completed by 400 respondents, consisting of :

(1) 200 sixth-formers (100 boys and 100 girls) from eight grammar schools (two boys' schools, three girls' schools and three mixed schools). Volunteers were drawn from the whole sixth-form, arts and science sides alike. The average age of the group was 17·53 years.

(2) 200 students (100 men and 100 women), mainly undergraduates in their Foundation Year of general studies at the University of Keele. The average age of the group was 20·01 years.

The main purpose of the questionnaire was to try to elicit accounts of extraordinary experiences of ecstasy, joy, peace, awe, reverence, fear, etc.—experiences which might be loosely described as ' transcendental,' ' numinous,' ' nature-mystical,' ' Wordsworthian ' or ' peak ' experiences. The method adopted was to quote in the questionnaire the following passage from Chapter 8 of W. H. Hudson's autobiography (Hudson, 1918). Any one of dozens of other similar autobiographical passages would have served equally well.

" It was not, I think, till my eighth year that I began to be distinctly conscious of something more than mere childish delight in nature. It may have been there all the time from infancy—I don't know ; but when I began to know it consciously it was as if some hand had surreptitiously dropped something into the honeyed cup which gave it at times a new flavour. It gave me little thrills, at times purely pleasurable, at other times startling, and there were occasions when it became so poignant as to frighten me. The sight of a magnificent sunset was sometimes more than I could endure and made me wish to hide myself away . . . The feeling, however, was evoked more powerfully by trees than by any other sight ; it varied in power according to the time and place and the appearance of the tree or trees, and always affected me most on moonlight nights. Frequently, after I had first begun to experience it consciously, I would go out of my way to meet it, and I used to steal out of the house alone when the moon was at its full to stand, silent and motionless, near some group of large trees, gazing at the dusky green foliage silvered by the beams; and at such times the sense of mystery would grow until a sensation of delight would change to fear, and the fear increase until it was not longer to be borne and I would hastily escape to recover the sense of reality and safety indoors, where there was light and company."

The respondents were requested to read through the passage and then asked: "Does this remind you of anything you have felt? If you have ever had an experience which you feel is *in any way similar* to the ones the writer of this passage is describing, please try to write about it. (It does not matter in the least where you were or what you were doing at the time; for instance, writers have described having experiences like this in a train, or ill in bed, or while reading a book, etc.)."

The use of the expression 'peak experiences' in this paper is meant to convey simply the variety of experiences which the respondents felt to be 'in any way similar' to those Hudson is describing, no more nor less than that. The phrase is not necessarily used in a way that Maslow, who coined it, would approve. The respondents, however, did describe virtually the whole range of experiences which Maslow calls 'peak experiences' and which he believes to be characteristic of 'self-actualising' or exceptionally well-adjusted, mentally healthy and effective people (Maslow, 1962a, 1962b, 1964).

The completion of the questionnaire was, in all cases, entirely voluntary, anonymous and confidential. Both sixth-form and undergraduate groups completed it in their own time and returned it in a sealed envelope. They were given no indication of the nature or purpose of the questionnaire before volunteering to complete it: they were merely asked to help with a piece of research by filling up a form and warned that it might take up to an hour of their time. Some importance is attached to this point since all previous attempts to elicit information about these kinds of experience have relied on published sources or on specific appeals for accounts of 'mystical' or 'religious' experiences or 'ecstasies' and so forth. (Starbuck, 1899; Bucke, 1901; Sinclair, 1928; Mass Observation, 1947; Laski, 1961; Hardy, 1969).

55 per cent of all the respondents wrote something in answer to this question. Many wrote at length and clearly took considerable pains over describing their experiences. Predictably, the range of experiences was very wide and included accounts of out-of-the-body (ecsomatic) experiences, levitation fantasies, descriptions of religious conversion, childhood terrors, 'uncanny' experiences, as well as more or less memorable feelings of awe, joy, peace, enhancement, etc. The respondents were also asked to complete a number of supplementary questions about the experiences they had described. A full account of this enquiry has been given elsewhere (Paffard, 1964). The purpose of the present paper is merely to look at the differences between the two groups of respondents, those describing experiences of some kind and those not doing so, and more particularly to investigate further a significant correlation that emerged between those describing such experiences and those expressing active interest in creative writing, painting, music and in the reading of poetry.

II.—OUTLINE OF MAIN FINDINGS.

The percentages of male and female sixth-formers and undergraduates writing in response to the request for accounts of experiences similar to those described by Hudson is shown in Table 1.

TABLE 1

RESPONDENTS (X GROUPS) WHO WROTE ABOUT EXPERIENCES SIMILIAR TO THOSE DESCRIBED BY HUDSON.

	Per cent describing 'peak' experiences
Male Sixth Formers	40*
Female Sixth Formers	61*
Male Undergraduates	56
Female Undergraduates	65

* The difference between these percentages is significant at the ·01 level.

For convenience we shall call these groups of respondents X groups to differentiate them from those who did not respond to this part of the questionnaire. In doing so, however, no claim is being made that they had had 'genuine' peak-experiences; only that they had written something in response to the question. They were asked at what age the experience or experiences they described had occurred and, when these were plotted on a graph, the curves for the four groups in Table 1 were so similar that they are not presented here. In each case the curve rose sharply from the age of 11 or 12 to a peak between 16 and 17 before beginning to fall so that these experiences appear to belong typically to adolescence rather than childhood. Were they associated with the onset of puberty, which has often been suggested, one might have expected some difference between the male and female respondents, but this was not apparent. A difference between the sexes does emerge, however, in respect of their creative artistic activities (see Fig. 1 below) and is also suggested in a number of studies of the age of religious conversion (Argyle, 1958, pp. 61 f.).

No significant differences between the X groups and the others were found in the following respects:

(1) Only child (X groups, 25 per cent, others 21 per cent).

(2) One or both parents dead (X groups 11 per cent, others 10 per cent).

(3) Living during most of childhood and teens in town or city (X groups 34 per cent, others 38 per cent), suburb or housing estate near the country (X groups, 38 per cent, others 30 per cent), small village or countryside (X groups 30 per cent, others 30 per cent).

(4) Having had a long or frequent short periods of illness (X groups 40 per cent, others 38 per cent).

(5) Practising member of a religion apart from school services (X groups 71 per cent, others 75 per cent).

It might be worth noting that the difference between the 61 per cent of all male sixth-formers and the 93 per cent of all female sixth-formers practising religion is significant (·01) and the difference between the 63 per cent of male undergraduates and the 75 per cent of females practising religion is just significant (·05).

Significant differences were found between the X and 'other' groups in the following respects:

1. Respondents were asked, "Would you say that, in your teens, you preferred *on the whole* to spend your spare time alone or with others?" Despite the wording of the question, not all respondents felt able to give an unqualified answer but the answers of the 85 per cent who did are given in Table 2. The difference between the 32 per cent of the X groups who preferred to spend their spare time alone and the 22 per cent of the others is just significant (·05).

TABLE 2

PERCENTAGES OF RESPONDENTS PREFERRING ON THE WHOLE TO SPEND THEIR SPARE TIME ALONE AND WITH OTHERS.

Groups		Alone	With others
Sixth form male	X	30	45
	Others	24	64
Sixth form female	X	26	61
	Others	12	67
Undergraduate male	X	39	51
	Others	17	72
Undergraduate female	X	34	45
	Others	34	60
All X		*32	*50
All Others		*22	*66

* The differences between the percentages of the two groups answering 'Alone' and 'With others' is just significant, $P < \cdot 05$.

2. Respondents were asked to indicate whether they read poetry for their own pleasure 'often,' 'sometimes,' or 'never.' The results are given in Table 3 where it will be seen that the difference between the 29 per cent of the X groups who read poetry 'often' and the 12 per cent of the others is significant (·01), and there are similar significant differences between the groups in respect of those who 'never' read poetry. The differences between the sexes in both sixth-form and university groups are in line with earlier investigations of the poetry-reading of younger secondary-school pupils (Jenkinson, 1940, pp. 98, 239) and training-college students (Mumford, 1947).

TABLE 3

PERCENTAGES OF RESPONDENTS READING POETRY FOR THEIR OWN PLEASURE.

Groups		Often	Sometimes	Never
Sixth form male	X	12	62	25
	Others	3	40	57
Sixth form female	X	33	61	7
	Others	10	62	28
Undergraduate male	X	36	55	9
	Others	14	66	20
Undergraduate female	X	35	61	4
	Others	23	63	14
All X		*29	60	*11
All Others		*12	58	*30

* The differences between the two groups is significant, $P < \cdot 01$.

3. Respondents were asked, " Have you ever, apart from compulsory school work, tried to write poetry, prose or music, paint a picture or anything else like this ? " Of all the X groups taken together, 88 per cent answered ' Yes ' whereas 58 per cent of the other groups did so. The difference between these percentages is significant (·01). Respondents answering ' Yes ' were further asked what forms of expression they had attempted and the answers are given in Table 4. It will be seen that, had the respondents been asked only about creative writing, the X groups would have been even more sharply differentiated from the others. The scores in Table 4 for ' poetry ' include a few more specific replies such as ' sonnets,' ' hymns ' ; the scores for ' prose ' include ' novels,' ' stories,' ' essays,' ' diaries.' Replies indicating that respondents played an instrument or sang rather than composed music were not included though it seems probable that some respondents who simply wrote ' music ' were referring to performing rather than strictly creative work. The heading ' painting ' includes references to ' drawing,' ' sketching,' ' portraits.' The comparatively few answers referring to photography, embroidery, modelling, carving, dramatics etc., have not been included in the tabulation.

TABLE 4

PERCENTAGES OF RESPONDENTS ATTEMPTING SOME FORM OF CREATIVE ART.

Groups		Poetry	Prose	Music	Painting	Total†
Sixth form male	X	45	30	28	55	92
	Others	20	10	5	25	47
Sixth form female	X	44	27	21	54	80
	Others	15	15	12	35	56
Undergraduate male	X	60	37	23	44	91
	Others	31	11	20	34	73
Undergraduate female	X	60	38	15	58	92
	Others	34	17	14	42	63
All X *		52	33	22	53	89
All Others*		25	13	12	34	60

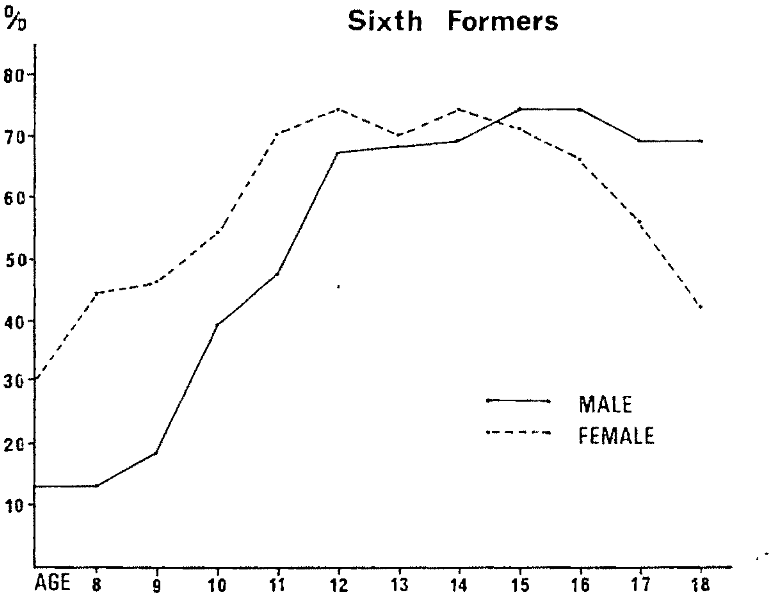
* The differences between the percentages for the two groups in all five columns are significant at the ·01 level.

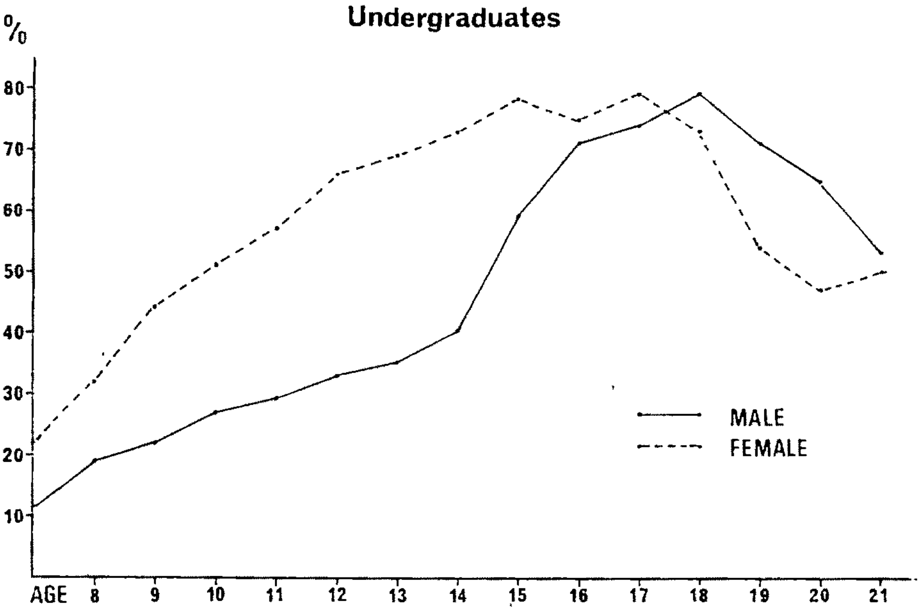
† The totals represent the percentage of respondents in each group attempting some form of creative art: many had attempted more than one.

Respondents were further asked between what ages they had made these attempts at creative art and their answers are shown in the graphs in Figure 1. The curves for the X groups and others are not shown separately as they were substantially similar. It will be seen that the girls appear to reach maximum ' creativeness ' some two or three years earlier than the boys in both school and university groups. Less predictable is the apparent tendency of the sixth-formers of both sexes to reach maximum ' creativeness ' some three years earlier than their undergraduate counterparts. This may perhaps be explained by a tendency on the part of the sixth-formers to antedate, or of the undergraduates to post-date the beginnings of their interest in artistic endeavours, or by a combination of the two. It seems unlikely to represent any real difference between the school and university groups.

FIGURE 1

PERCENTAGE OF RESPONDENTS ATTEMPTING CREATIVE ART AT VARIOUS AGES.





In the light of the differences between the X and other groups in respect of creative artistic activities (Table 4), it is worth recording that one of the supplementary questions the X groups were asked about the peak-experience they had described was, " Did this experience make you strongly desire anything, or to be able to do anything ? " A third of the respondents wrote 'No,' 'Nothing,' or left this question blank. However, of those who did answer the question, by far the largest group (20 per cent of the total X group) said that the experience had made them want to write, paint or express the experience in some other or unspecified way. Typical answers were, " I wanted to write it down but knew that I could never express myself well enough to convey the experience even partially " ; " Made me want to write and communicate it " ; " It made me want to describe my feelings in prose if I could not in poetry"; "It made me want to express the scene or at least express myself by physical movement " ; " To sing, shout and dance for the joy of living."

Similarly, respondents who answered ' Yes ' to the question whether they had ever tried to write poetry, paint a picture, etc., were further asked, " Have you any idea what made you want to make this attempt ? " 31 per cent said that they were not sure or did not know, and the answers of the rest, which were often full and extremely interesting, were difficult to classify (but see Paffard, 1959). However, in studying the spread of the more typical answers, it appeared that 22 per cent were concerned with expressing (relieving, recording, recapturing) the self (inner feelings, emotions) and 17 per cent with the desire (urge, longing) to create something beautiful (worthwhile, of my own).

Finally, it was decided to compare the |75 per cent of the 400 respondents who said they had made some attempt to write, paint, etc., apart from compulsory school work with the 25 per cent who said they had not. For convenience we will call the former the C or creative group. It should be emphasised, however, that the questionnaire provided no evidence of how serious, sustained or successful their creative efforts had been.

No significant difference was found between **the** two groups in respect of being only children, having lost one or both parents, living in a town, suburb or country, or in practising a religion. However, 31 per cent of the C group said they preferred on the whole to spend their spare time ' alone ' rather than ' with others ' compared with 20 per cent of the non-creative group, and this difference is just significant (·05). Similarly 41 per cent of the C group said they had had long or frequent short periods of illness compared with 29 per cent of the non-creative group. This difference is also just significant (·05). In answering the question whether they read poetry for their own pleasure often, sometimes or never, 28 per cent of the C group said they read poetry ' often ' and only 2 per cent ' never ' while the comparable figures for the non-creative group were 12 per cent and 45 per cent. The differences between the two groups here are significant at the ·01 level.

III.—CONCLUSIONS.

The questionnaire data on which this paper is based is clearly of a highly subjective nature and it would be inappropriate to regard the findings reported above as more than suggestive. To say that 55 per cent of the 400 respondents had had ' peak ' experience is to raise a host of unanswerable riddles. When is a ' peak ' experience not a ' peak ' experience ? To take one example, some people may only experience the *frisson* of aesthetic pleasure once or twice in a lifetime and therefore regard it as extraordinary and memorable : for others it may be an almost daily occurrence and therefore unremarkable.

What one can say is that, confronted with the questionnaire which they had volunteered to complete and of which they had no advance knowledge, 222 out of 400 young people attempted to describe experiences which seemed to them in some way similar to the nature-mystical joy and awe described by Hudson and many other autobiographers. Despite the fact that the questionnaire was entirely anonymous and could not be followed up, some respondents may have been inventive or derivative in what they wrote in an attempt to be co-operative, though in the great majority of cases their scripts appeared, with varying degrees of articulateness, to be honest attempts at reporting first-hand experience. Other respondents who wrote nothing may have done so through laziness or because they felt the impossibility of putting into words a kind of experience that is notoriously described as 'ineffable.' All one can say is that perhaps William James was right in believing that many, if not most, people have in their make-up what he called 'the mystical germ.' Their ability to respond to a good deal of literature commonly read in schools (Wordsworth's poetry would be an obvious case in point) might well be related to this question.

One can go a little further and say that respondents who tried to describe 'peak' experiences were also significantly more likely to have attempted to express themselves in some form of creative art and to be interested in reading poetry than those who did not, and marginally more likely to prefer to spend their spare time alone. Respondents who had attempted some form of creative art were found to be marginally more likely to prefer to spend their spare time alone and to have had periods of illness in childhood and adolescence and significantly more likely to be interested in reading poetry. The respondents, sixth-formers and undergraduates, were by definition intelligent, literate, academically able, and presumably also a biased sample of the population in their social class background. It would be interesting to know whether the X and other groups could be differentiated in terms of sociological factors, IQ, academic achievement, subject interests and a variety of personality traits.

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EFFECTS OF UNFAMILIARITY ON THE OVERT VERBALISATION AND PERCEPTUAL MOTOR BEHAVIOUR OF NURSERY SCHOOL CHILDREN

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SUMMARY. A group of nursery school children from poor socio-economic conditions were subjected to familiar and unfamiliar social and physical conditions. Under unfamiliar conditions, even with opportunity to learn the tasks beforehand, children showed decreased motor-perceptual and verbal behaviour. They also showed freezing behaviour similar to fear reactions in other animals together with global gazing. Some practical suggestions are made with regard to handling this behaviour in clinical situations together with indications for further research.

I.—INTRODUCTION.

PREVIOUS research has suggested that unfamiliarity of environment may inhibit the overt behaviour of handicapped children. Brown (1966) indicated that severely subnormal children exposed to unfamiliar social and physical conditions experienced a decrement in performance on a form board task over a period of several days. Hutt and Hutt (1964) have also shown that distractible behaviour as measured by range of stimuli engaged may be a function of the complexity of the environment. They suggest the behaviour of some organically damaged children is abnormal in the sense that it appears like the behaviour of much younger children. Furthermore, the type of response given to unfamiliar situations at different ages may represent a fairly sensitive measure of disturbance. Hutt, Hutt and Ounsted (1965) suggest that age represents an important variable in terms of exploratory behaviour and Schaffer (1966) shows that particular responses to unfamiliar environment may be a function of age. There is some evidence to suggest that children deprived of their mother for brief periods early in life show little adverse effects provided they remain in the same physical surroundings (Douglas and Blomfield, 1958). We may hypothesize, therefore, that the development of consistent schemata or sets in relation to a stable physical environment is a fundamental requirement for satisfactory human adjustment. Indeed, the formation of a behavioural set in a particular environment may be a prerequisite of later transfer to other environmental settings. In unfamiliar or fairly unfamiliar environments such behavioural sets may be inhibited. However, because early learning is particularly slow in handicapped and young persons (Clarke and Clarke, 1965; Hebb, 1949), it would seem likely that such persons need to experience changes in environment for longer periods of time if they are to adapt to the change and establish consistent behaviour under these circumstances. Thus we may expect young children who have not carried out 'early learning processes' and those from unstable environments to show disturbance in unfamiliar settings. It is also recognised that disturbed children come from unstable environments. Such research as the above suggests that changes in environment may need to be programmed into education situations. The young and disturbed are those who are referred for psychological and other types of examination within unfamiliar settings. They are often presented with unfamiliar material by unfamiliar examiners. It, therefore, seems important to examine the effects of environmental unfamiliarity and ascertain the limits of such effects in terms of age, duration, association with type of task and association with child disturbances. In addition to this it is important to examine the types of behaviour under such conditions. Brown (1966) has spoken of freezing behaviour, and global gazing in addition to restriction of motor movement and an inability to carry out motor tasks at speed. It is suggested that such behaviour may result from a reduction in the potential responses available to the child—thus he may limit his responses to those aspects of his environment which are very familiar and thus tend to perseverate. Hutt, Hutt and Ounsted (1965), for example, refer to high level of investigatory responses in unstructured environments involving touching objects in the new situation and glancing from one object to another.

Berg (1966) notes the attachment responses of young children to their mothers and gradual withdrawal from the mother in order to explore the environment tentatively with subsequent and frequent return to the mother. Young monkeys also show similar behaviour and Harlow (1961) has demonstrated the dramatic effects of intrusion of unfamiliar objects within the environment of the monkey deprived of its mother figure.

The present research was designed in the context of the above observations and suggestions, with a view to examining the behaviour of nursery school children within familiar and unfamiliar environments. Although previous work has tended to concentrate on motor and perceptual behaviour, an examination of verbal responses was also included in the present experiment. It was predicted that overt verbalisation is like motor performance, restricted by unfamiliarity of environment despite previous contact with the test material. It was also predicted that gazing, glancing and freezing behaviour is associated with unfamiliarity of the environment. In view of previous work it was hypothesized that any unfamiliarity effects are not readily modified by frequent exposure to the unfamiliar environment but may last over a period of several trials presented on successive days.

II.—METHOD.

A motor-perceptual task and a word-naming task were presented to children on five occasions. The experimenter (L.S.) had previously familiarised herself with the children by spending two full days in the classrooms. One trial per task was given each day, the motor task preceding the word-naming task. Every child was seen individually. The first trial on each task took place in the child's own classroom and, using the score from the motor task, the children were divided into two matched groups according to sex. The first group continued to be seen in their own classroom while the other group was observed in a relatively unfamiliar room, in another part of the nursery school building. Thus, the second group was presented with an unfamiliar room and was also presented with a change in social stimulation as their peers and regular teachers were no longer present. Three trials were given under these conditions.

After this, the groups were reversed in terms of familiar and unfamiliar conditions. Only one trial was given under the reversed conditions. The procedure is outlined below:

		Group 1	*Group* 2
1st	Testing	Familiar	Familiar
2nd			Unfamiliar
3rd			Unfamiliar
4th			Unfamiliar
5th		Unfamiliar	Familiar

Both tasks were presented on each occasion.

The motor-perceptual task consisted of a 14-piece form board with shapes ranging from simple items, such as a circle, to more complex irregular patterns. It is the same apparatus used in an experiment by Brown (1966). On each trial the shapes were placed on a table in random order while the form board was placed on an adjoining table. The subject was requested to: " Put the pieces in the right hole." No further verbal communication was made other than in response to a child's query, when the Experimenter replied: " You do it." The task was scored for number of items placed within a standard time limit of three minutes.

In the verbal task the subject was requested to name the parts of a doll· The Experimenter pointed to the item, e.g., the eye, and said: " What is this ? " Where applicable a further question: " What colour is it ? " was asked. Twenty-four questions were asked over a period of two minutes. The total number of words used by each child represented the trial score. Each word spoken was scored as 1. Words such as ' won't ' and ' wasn't ' were scored as 1. If child said " don't know," E supplied the answer and continued. Any items not reached at the end of the allotted time were named by E.

In addition to the above scores, global gazing behaviour, that is looking up from the task and gazing around the room, was recorded in terms of the number of times each subject produced this behaviour on each day (i.e., this was the combined score for both tasks on each day). Freezing or staring behaviour was also noted. This referred to the subject stopping overt behaviour and remaining motionless. No limit was applied to such behaviour ; thus, it could occur several times during each trial.

III.—SUBJECTS.

The subjects consisted of 30 nursery school children selected from three classes aged over 3 but under 5 years. All resided in an under-privileged socio-economic area, on a council housing estate which had resulted from slum clearance. There was a large waiting list for entry into the school and those attending were regarded as the most under-privileged and disturbed children in the area. After the initial trial the subjects were divided into two groups of 15, as described above. There were eight girls and seven boys in each group. The mean age of Group 1 was 46·7 months (sd 3·9) and of Group 2, 46·5 months (sd 3·4).

IV.—RESULTS.

The form-board results can be seen in Figure 1. The two groups of subjects showed similar responses on trial 1, which was carried out under familiar conditions. On trial 2 the subjects in Group 1 (familiar conditions) improved their scores while Group 2, now presented with unfamiliar conditions, produced fewer correct responses. These conclusions are confirmed by the statistical analysis shown in Table 1.

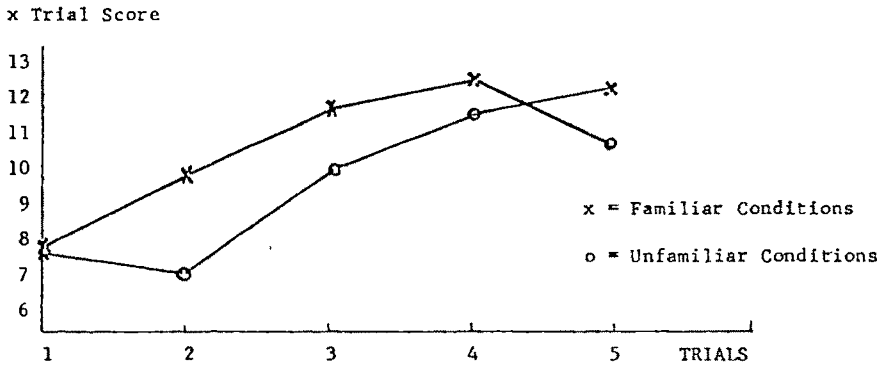

FIGURE 1

PERFORMANCE BOARD MEAN SCORE FOR TWO GROUPS UNDER FAMILIAR AND UNFAMILIAR CONDITIONS.

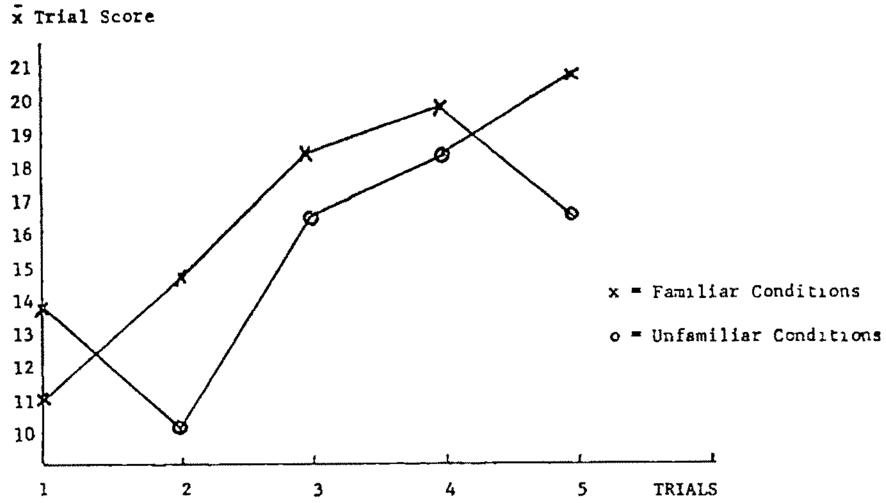

FIGURE 2

LANGUAGE TASK MEAN SCORE FOR TWO GROUPS UNDER FAMILIAR AND UNFAMILIAR CONDITIONS.

Figure 1 also shows that both groups of subjects increased their scores over trials 2-4. Nevertheless, subjects under unfamiliar conditions were on average less efficient, despite a greater increase in their scores. These results are supported by the analysis reported in Table 2.

On trial 5 the groups changed from familiar to unfamiliar conditions and *vice versa*. Figure 1 shows an increase in performance for the group now in familiar conditions but a sharp decrease for the group experiencing unfamiliar conditions in trial 5 for the first time. The results are summarised in Table 3.

Figure 2 shows the language scores for each trial under familiar and unfamiliar conditions. The graph lines indicate a decrease in performance for subjects moving from familiar (trial 1) to unfamiliar (trial 2) conditions but a rise in performance for those remaining in familiar surroundings. There is a steep rise in overall performance from trials 2-4. However, on trials 2-4 in unfamiliar conditions Group 2 continued to perform less adequately than subjects in Group 1. In trial 5 when conditions were reversed, levels of performance accordingly reversed.

The results are summarised in Table 4. However, it should be noted that, despite the tendency for Group 1 to score higher than Group 2 on trials, the 2-4 differences did not reach an acceptable level of statistical significance.

TABLE 1

ANALYSIS OF TRIALS 1 AND 2 ON PERFORMANCE TASK.

Source	Ss	df	Variance	F		P
Between Groups	35·27	1	35·27	35·27 / 0·85	41·49	<·001
Between Trials	5·40	1	5·40	5·40 / 1·88	2·87	NS
Between Subjects	330·02	14	23·57			
Interaction :						
Groups/Trials	32·26	1	32·26	32·26 / 2·90	11·12	<·001
Groups/Subjects	11·94	14	0·85			
Trials/Subjects	26·31	14	1·88			
Groups/Trials/Subjects	40·53	14	2·90			
Total	481·73	59				

TABLE 2

ANALYSIS OF TRIALS 2, 3 and 4 ON PERFORMANCE TASK.

Source	Ss	df	Variance	F		P
Between Groups	80·28	1	80·28	80·28 / 8·73	9·19	<·01
Between Trials	220·42	2	110·21	110·21 / 2·06	53·50	<·001
Between Subjects	271·82	14	19·42			
Interaction :						
Groups/Trials	18·16	2	9·08	9·08 / 1·07	8·48	<·01
Groups/Subjects	122·22	14	8·73	8·73 / 1·07	8·15	<·01
Trials/Subjects	57·58	28	2·06			
Groups/Trials/Subjects	29·85	28	1·07			
Total	800·32	89				

TABLE 3

ANALYSIS OF TRIALS 4 AND 5 ON PERFORMANCE TASK (I.E., REVERSE CONDITIONS).

Source	Ss	df	Variance	F	P
Between Groups (Reversed)	21·60	1	21·60	$\frac{21\cdot60}{3\cdot35}$ 6·44	< ·05
Between Trials	6·67	1	6·67	$\frac{6\cdot67}{0\cdot99}$ 6·74	< ·05
Between Subjects	109·10	14	7·79		
Interaction :					
Groups/Trials	2·40	1	2·40		
Group/Subjects	46·90	14	3·35		
Trials/Subjects	13·83	14	0·99		
Groups/Trials/Subjects	109·04	14	7·79		
Total	309·54	59			

TABLE 4

SUMMARY OF SIGNIFICANT F RATIOS AND P VALUES FOR LANGUAGE TASK.

	F	P
Trials 1 and 2 : Interaction Groups Trials df n_1 1 n_2 28..................	22·29	< ·001
Trials 2, 3 and 4 : Between Trials df n_1 2 n_2 56	43·80	< ·001
Trials 4 and 5 : Interaction Groups Trials df n_1 1 n_2 28....................	49·64	< ·001

TABLE 5

INCIDENCE OF GLOBAL GAZING AND FREEZING BEHAVIOUR.

	Trial 1 Both groups in familiar setting		Trials 2–4 Group 2 in unfamiliar setting		Trial 5 Group 1 in unfamiliar setting	
Incidence of Global Gazing	<2	>3	<4	>5	0 or 1	>2
Group 1	8	7	11	4	3	12
Group 2	10	5	5	10	13	2
χ^2	0·04		3·35		10·85	
P	—		< ·10		< ·001	
Incidence of Freezing Behaviour	0	>1	0	>1	0	>1
Group 1	6	9	7	8	4	11
Group 2	4	11	1	14	9	6
χ^2	0·15		4·26		2·17	
P................	—		< ·05		> ·10	

Analysis of global gazing behaviour on trial 1 (familiar conditions) indicates that there was no difference between the two groups of subjects. There was a tendency for a greater incidence of global gazing in unfamiliar compared with familiar conditions in trials 2-4 ($P < \cdot 10$, 2-tail test). This effect was more marked when the groups reversed conditions in trial 5 ($P < \cdot 001$), the subjects under unfamiliar conditions showing a considerable degree of global gazing.

An examination of the freezing behaviour showed no significant difference between the groups during trial 1 under familiar conditions. Summation of freezing behaviour in trials 2-4 showed a higher incidence in the unfamiliar group of subjects than those working under familiar conditions ($P < \cdot 05$). In the fifth trial where conditions were reversed, there was a tendency for the group in the unfamiliar conditions to show the greater degree of global gazing, though this did not reach an acceptable level of statistical significance.

V.—DISCUSSION.

The results confirm the hypotheses raised at the beginning of this experiment, that children subjected to unfamiliar social and physical conditions show considerable handicap in terms of motor perceptual and language behaviour. It is also apparent that individuals who are placed in unfamiliar environments show behaviour very similar to that found in animals submitted to strange and fear-provoking situations. A greater degree of global gazing does occur under unfamiliar conditions though it should be remembered that both global gazing and freezing behaviour were subjectively assessed in the experimental situation, and these results must be interpreted with caution. In unfamiliar situations individuals look up from their tasks and around the room. Some subjects indulge in freezing behaviour where, for 30 seconds or more, they show no movement and stare at one point in space or at the material in front of them. The graphical data and the statistical analysis indicate that such behaviour lessens from one day to another. Nevertheless, there are still differences in performance after three consecutive days in the unfamiliar environment, though the difference between the groups lessened to a considerable degree. It is interesting that individuals, who have become familiar with the tester and the tests being presented to them, and have been responding in a familiar environment, over a period of four days show significant loss in performance and increase in gazing and freezing behaviour, when changed to an unfamiliar room with the same familiar test and tester. It is apparent that there needs to be further investigation to see how long the effects of unfamiliarity last, both with and without opportunities to adapt to the features of the task beforehand.

These results suggest that children who are subjected to tests at a pre-school age in a clinic are likely to perform well below their optimum score. It may be argued that this is taken into account in the standardisation of the tests. If it could be shown that children who are disturbed show poorer adaption to unfamiliar conditions than other children, this argument would be to some degree inappropriate. This possibility is supported by the fact that children from adverse home environments show greater attention problems in experimental situations than subjects from less adverse conditions (Brown, 1964). It would seem of some importance that a psychologist who is examining the performance of pre-school children, particularly those from a deprived background, should examine behaviour under familiar conditions in order to gain a sample of optimal language and perceptual motor behaviour. It is suggested that these results indicate that the tester should get to know the child in a familiar environment prior to testing and should, wherever possible, carry out testing within that environment. If this is not possible, the child should be given opportunity to respond on more than one occasion within the same though unfamiliar environment. The results underline the fact that children who are changed from one place to another, to new homes, new classes, or other strange places, are likely to show variations in several aspects of their performance over a considerable period of time, and to indulge in behaviour which may seem abnormal. Their behaviour is, it appears, an attempt to adjust to an unfamiliar situation. The results indicate quite clearly that there are considerable individual differences in the way children behave under these circumstances and further investigation is desirable.

Subjects reduce scores when placed in unfamiliar environments, even after opportunity to learn a task in familiar conditions. This may suggest that performance should be overlearnt before environments are changed. Teachers, doctors and others should also become more aware of the short and long term effects of unfamiliarity.

It would appear that the need to respond to new aspects of an environment dominate over social requests to perform in a particular way to specific material. To put this another way, when the ' figure ' remains familiar but the ground changes there is a shift from figure to ground. The relevance of this to attention theory is important because it stresses the fact that newness of environment is a major factor in disrupting behaviour. Since, for example, attention disruption is often seen as a symptom of brain injury (Cruickshank *et al.*, 1961) and children are examined for this in unfamiliar situations it would seem likely that misdiagnosis may often occur. Of course, certain types of brain injury may cause attention difficulties because they slow down the rate of learning to adapt to new environments. The present experiment indicates a further variable which must be taken into account when interpreting behaviour. It is only when we observe behaviour under different but natural conditions that we become aware of the complexity of interaction responsible for any particular behaviour.

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THE HEAD TEACHER ROLE: SOME DIFFERING EMPHASES OF MALE AND FEMALE HEAD TEACHERS

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SUMMARY. The responses of 162 male and 181 female head teachers to a Head Teacher Role Definition Instrument (HRDI) were compared by chi-square analysis. The head teachers were randomly selected from primary and non-selective secondary schools throughout England and Wales. The HRDI, developed with the assistance of head teachers, had a test-retest reliability of ·804. Hypotheses derived from American studies of the school principalship, which predicted stronger professional orientations on the part of female head teachers in respect of ideologies of service and technical competence were not supported. In confirmation of previous American research male head teachers were found to hold more autonomous role conceptions than female head teachers in connection with their relationships with teachers, parents and expert authority sources external to the school.

I.—INTRODUCTION.

HEAD teachers' role conceptions, that is, their beliefs about what they should or should not do as heads, probably derive from two major sources.

Firstly, *personal factors* influence the beliefs that a head teacher holds about what are appropriate role performances. American evidence suggests that older head teachers may tend to be more traditionally-minded, more authoritarian, and less receptive to educational innovation than their younger colleagues (Prince, 1957; Wilcox, 1957; Ryans, 1960; Ramer, 1968). Secondly, *situational factors* serve to define what are appropriate beliefs and behaviours. The type of school, for example, and the part played by the school in the processes of socialisation, selection and allocation (Parsons, 1959) circumscribe the roles allocated to and enacted by school personnel What Parsons has described as a " quasi-motherliness, expressed in particularistic needs-oriented support for the child " is both more appropriate and more in evidence in primary as compared with secondary education.

Few studies are reported which have focused primarily upon the personal factor ' sex ' as the independent variable in relation either to the beliefs or the performances of the school principal. What evidence there is in the literature is piecemeal and unsystematic.

The relationship between the sex of head teachers and the degree to which they hold *authoritarian role conceptions* is unclear, Hines (1956) reporting women principals to be significantly less authoritarian than men, Wilcox (1957), also employing F-scales, finding women teachers to be more authoritarian than men but reporting no difference between female and male principals.

A number of studies have provided evidence of differences in the *professionalism* of male and female heads. Professionalism has been defined in a variety of ways but a common element in the usages extant in the literature is that the orientation of the head teacher towards his role expresses an *ideology of service* rather than self-interest. Because kindness, nurturance, and helping others are more typically an extension of sex-role training for women than for men, it has been argued that the professional service ideal is more likely to be highly valued by women teachers than by their male colleagues (Colombotos, 1963).

A second element in the various conceptualisations of professionalism concerns the *technical competence* of the head teacher. Technical competence encompasses both knowledge of teaching methods and techniques and skills in working with teachers to help them upgrade their teaching performances. A third aspect of the concept of professionalism has to do with the *autonomy* of the school principal to do the job in the way that he or she sees fit.

Colombotos (1963) found that female teachers were more professional than males in respect of both the technical competence and service ideal aspects of their role conceptions. Neither Scott (1958) nor Gross and Popper (1965), however, were able to differentiate between male and female heads in respect of their ideologies of service. In Colombotos' study, the greater desire of male teachers as compared with female teachers for freedom, responsibility and autonomy in their work just failed to reach an acceptable level of statistical significance. Hemphill, Griffith and Frederickson (1962) showed female head teachers to be superior to males both in working with teachers and in their knowledge of teaching methods and techniques. Hoyle and Randall (1967) tested the administrative performances of male and female principals and found females more sensitive than males to potential problem situations in schools. Gross and Herriott (1965) reported that younger single female principals exhibited significantly greater 'executive professional leadership' (EPL) than their male counterparts; similarly, older married female principals obtained significantly higher EPL scores than older married males. The EPL of head teachers was specifically concerned with their efforts to get teachers to upgrade the quality of their classroom performances.

II.—THE PRESENT STUDY.

This paper, part of a larger study (Cohen, 1970), examines the relationship between sex and role conceptions in a national sample of head teachers randomly selected from schools in England and Wales.

The distributions of the responses of 162 male and 181 female head teachers to a Head Teacher Role Definition Instrument (HRDI) consisting of 78 statements of head teacher behaviour were compared by chi-square analysis.

Head teachers indicated on a five-interval scale, adapted from Gross, Mason and McEachern (1958), how strongly they believed that a head teacher should or should not behave in the manner described in the HRDI items. The range of the response categories enabled heads to express mandatory, preferential, and unresolved beliefs in respect of each item of behaviour (see Appendix). The HRDI, based upon the Leadership Behaviour Description Questionnaire of Stodgill and Coons (1957), was constructed with the assistance of head teachers and ex-head teachers and had a test-retest reliability of ·804.

The disproportionally large number[*] of female head teachers in primary as compared with secondary schools in the sample made it impossible to control systematically throughout the analysis for such situational factors as the type, size, and socio-economic neighbourhood of the school. It was imperative, therefore, in testing hypothesised differences by sex not only to impose situational controls wherever frequency distributions permitted but also to use only those statements of head teacher behaviour which could be regarded as generally relevant to all heads, irrespective of situational variables. By way of example, item 42, " Expect staff to carry out his/her decisions even when they believe them to be unsound," expresses a view of professional relationships in the school relevant for consideration by all head teachers. By contrast, item 7, " Use

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[*]

	Infant	Junior	Secondary	
Male	0	80	82	(162)
Female	110	43	28	(181)

contacts with officials of local firms to help school leavers find worthwhile employment," is relevant to some heads only, in this instance, to secondary school head teachers.

Cell numbers permitted the introduction of the following controls:

(1) Male heads in junior schools *versus* female heads in junior schools.
(2) Male heads in small junior schools *versus* female heads in small junior schools.
(3) Male heads in suburban junior schools *versus* female heads in suburban junior schools.
(4) Male heads in secondary schools *versus* female heads in secondary schools.
(5) Male heads in large secondary schools *versus* female heads in large secondary schools.

Where significant differences between male and female head teachers are also supported beyond the ·05 level of statistical significance in subsequent control analyses these are indicated in the tables of results by the inclusion of the appropriate numerical references (1), (2), (3), (4) or (5).

III.—RESULTS.

(a) *Authoritarianism and the sex of the head teacher.*

The term authoritarian is used in the general popular sense rather than in the specific sense of a syndrome of traits which go to make up the authoritarian personality (Adorno *et al.*, 1950). In the present usage, it is intended to describe a head teacher's predeliction for high-handed, arbitrary, autocratic behaviour toward subordinate members of the school and toward parents. Three HRDI items were selected in order to test the degree of authoritarianism expressed toward children, teachers and parents. Both in the specific usage of authoritarianism (Hines, 1956) and in the general usage here (Willower *et al.*, 1967) previous research suggests that such behaviour is more likely to be exhibited by male rather than female head teachers. It was hypothesised that male head teachers as compared with female head teachers would give greater support to the following items of role behaviour:

Item 18. " Teach children to obey orders at once and without question."

Item 42. " Expect staff to carry out his/her decisions even when they believe them to be unsound."

Item 70. " When dealing with a ' difficult ' parent, speak in a voice not to be questioned."

Table 1 shows that the hypothesis was supported only in respect of male head teachers' behaviour towards teaching staff. Controlling for type and size of school provided further support for the reported distinction between male and female heads. Arbitrary, autocratic behaviour towards teachers was more strongly supported by male head teachers in secondary schools generally, and in large secondary schools in particular.

TABLE 1

AUTHORITARIANISM AND THE SEX OF HEAD TEACHER.

Item No.	χ^2	df	Significance level	Direction predicted	Hypothesis supported	Finding supported in control analyses
18	6·90	4	NS	no	no	
42	25·04	4	·001	yes	yes	(4), (5)
70	7·79	4	NS	no	no	

The distribution of the responses of male and female head teachers to item 42 (and other HRDI items) is shown in the Appendix.

(*b*) ***Professionalism and the sex of the head teacher.***

(i) *Service-ideal*: Colombotos' distinction between the role conceptions of male and female teachers in terms of their respective sex-role identification was held to be equally as relevant to a British as to an American group. It was hypothesised that female heads as compared with male heads would give greater support to the following items of role behaviour :

Item 8. " Know the emotional problems of children in the school and help them with their difficulties."

Item 10. " By his/her own example, in dealing with children stress kindness and courtesy."

Item 11. "Act as a mediator in conflicts between children."

Item 12. "Allow a child to confide in him/her with problems he does not wish to discuss with his parents."

Item 36. " Encourage a pleasant atmosphere among staff by being friendly and approachable to all."

Item 38. " Know his/her staff well enough to be able to help them with personal problems in connection with their work as teachers."

Item 63. " Mediate between parent(s) and a teacher over a child's school behaviour or performance."

Item 64. "Advise parents new to the district about neighbourhood affairs and amenities."

Item 74. " Take an active interest in the problems of the school neighbourhood by holding a responsible position in a community organisation."

Table 2 shows that there was no support for the hypothesis that female head teachers placed greater emphasis than their male colleagues on service ideal aspects of their role. Indeed, on items 11, 63 and 74, the findings were significantly different from what was predicted. It was the male head teacher rather than the female who gave greater support to behaviour which was concerned with mediation roles and involvement in community affairs. Controlling for type, size and location of school showed that the junior school male head in particular, exceeded his female colleagues in the degree of support he gave to the mediation aspects of the head teacher's role and to participation in community affairs.

TABLE 2

SERVICE-IDEAL AND THE SEX OF THE HEAD TEACHER.

Item No.	χ^2	df	Significance level	Direction predicted	Hypothesis supported	Finding supported in control analyses
8	0·00	1	NS	—	no	
10	3·12	1	NS	yes	no	
11	13·01	3	·005	no	no	(1)
12	0·40	2	NS	—	no	
36	1·42	1	NS	yes	no	
38	0·01	1	NS	—	no	
63	10·81	3	·025	no	no	(1), (2), (3)
64	3·11	3	NS	no	no	
74	18·69	3	·001	no	no	(1), (2) (3)

(ii) *Technical competence*: Seven items were selected from the HRDI to test the hypothesis suggested by previous American research that female head teachers would be more concerned than males with the technical competence aspects of their role performances. Specifically it was hypothesised that female head teachers as compared with male head teachers would give greater support to the following items of role behaviour:

Item 20. " Examine a representative sample of the work of each class during the school year."

Item 26. " Inspect the work and progress of those children suspected of underachievement by teachers and parents."

Item 27. " Discuss with teachers new material and methods which might improve the quality of the teaching."

Item 28. " Requisition appropriate equipment for staff who wish to experiment with new methods."

Item 39. " Supervise the preparation and the teaching of newly-qualified staff."

Item 40. " Require records or forecasts of every teacher's work."

Item 51. " Make his/her requirements about school standards known to each member of staff."

Table 3 shows that there was no support for the hypothesis that female head teachers were more likely than their male colleagues to stress the technical competence aspects of their role relationships with their teaching staffs.

TABLE 3

TECHNICAL COMPETENCE AND THE SEX OF THE HEAD TEACHER.

Item No.	χ^2	df	Significance level	Direction predicted	Hypothesis supported	Finding supported in control analyses
20	5·69	2	NS	no	no	
26	0·04	1	NS	—	no	
27	2·01	1	NS	no	no	
28	2·71	2	NS	no	no	
39	0·08	2	NS	—	no	
40	2·71	3	NS	yes	no	
51	1·32	1	NS	yes	no	

(iii) *Autonomy*: In the light of the findings reported by Colombotos (1963), Hemphill, Griffith and Frederickson (1962) and Hoyle and Randall (1967), it was hypothesised that female head teachers would be less likely to desire a strongly autonomous role in their relationships with teachers or with parents, and that more than their male colleagues, female heads would be open to influence from authoritative sources external to the school.

Specifically, it was hypothesised that female head teachers as compared with male head teachers would give less support to the following items of role behaviour:

Item 43. " Use veto power when a staff decision is contrary to his/her firmly held convictions."

Item 55. " Resist external pressures from parents to alter the school curriculum or the teaching methods used."

And female head teachers as compared with male head teachers would give greater support to the following items of role behaviour :

Item 53. " Implement suggestions made by Her Majesty's Inspectorate for the improvement of some aspect of the school curriculum or teaching method."

Item 54. " Invite parental discussion of new practices before their introduction into the school programme."

Table 4 shows that the hypothesis that female head teachers would exhibit less strongly autonomous role conceptions than male head teachers was supported. The imposition of controls for type, size and location of schools provided further evidence of the hypothesised difference. Junior school male heads exhibited significantly stronger beliefs in role autonomy than their female counterparts.

TABLE 4

AUTONOMY AND THE SEX OF THE HEAD TEACHER.

Item No.	χ^2	df	Significance level	Direction predicted	Hypothesis supported	Finding supported in control analyses
43	12·03	4	·025	yes	yes	
53	11·30	2	·005	yes	yes	(1), (2), (3)
54	10·43	4	·05	yes	yes	(3)
55	11·58	4	·025	yes	yes	(1), (2), (3)

IV.—DISCUSSION.

The present study offers no support for the findings of American research into the school principalship that female head teachers may be distinguished from their male colleagues in respect of their stronger ideologies of service or their greater emphasis on the technical competence aspects of their role performances. Indeed, in respect of the junior school sector, our results suggest that it is the male rather than the female head teacher who is more likely to be found volunteering for positions of leadership in local community organisations. In confirmation of American studies, the most interesting difference to emerge in the research is the finding of more autonomous role conceptions among British male head teachers than among their female colleagues.

Male head teachers express their greater determination to exercise a leadership over school policy based more upon personal judgment than discussion or consultation with staff, parents or inspector. The stronger support of high-handed, arbitrary behaviour towards teachers on the part of the secondary school male head is interpreted as evidence of his intention to exercise a considerable degree of autonomy in the performance of his role. The greater readiness of the junior school male head to take the position of mediator in a teacher-parent disagreement implies a belief that his role autonomy is sufficient to resist the pressures of either party to such a dispute.

These are important differences between male and female head teachers in their conceptions of school leadership and they have implications both for staff morale and parent satisfaction. Teachers, for example, wish to see *less* autonomy on the part of the head teacher in respect of his range of decision-making within the school (Sharma, 1963 ; Edman, 1968) and parental pressures increasingly urge towards the fuller partnership in the educational system proposed in the Plowden Report (Goodacre, 1968).

Further research is needed to show how other factors, both personal and situational, variously relate to the sex differences reported here. Long-term systematic studies of the head teacher position are necessary if we are to accumulate sufficiently practical findings to attract the attention of education committees as they go about their selection procedures. Studies which aid in the selection and placement of head teachers may promote both the well-being and personal satisfaction of the individual head and the effectiveness of the school in reaching its manifold educational objectives.

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VI.—Appendix.

The instructions accompanying the Head Teacher Role Definition Instrument (HRDI) asked the head teacher how strongly he believed he should or should not behave in the way described in each statement.

The five-interval response scale permitted the following replies:

AM=absolutely must
PS=preferably should.
MMN—may or may not
PSN=preferably should not
AMN=absolutely must not

A copy of the full HRDI is available on request from Louis Cohen, School of Research in Education, University of Bradford, Bradford 7.

Distributions of the Responses of Male and Female Head Teachers to Selected HRDI Items.

Item No.		AM	PS	MMN	PSN	AMN	N/A	Totals
11	Male	62	42	48	9	1	0	162
	Female	44	40	73	23	1	0	181
42	Male	51	50	28	20	11	2	162
	Female	26	42	42	49	19	3	181
43	Male	44	45	43	18	10	2	162
	Female	29	41	55	39	13	4	181
53	Male	15	71	75	0	0	1	162
	Female	28	97	52	0	0	4	181
54	Male	4	32	77	35	13	1	162
	Female	10	47	89	26	5	4	181
55	Male	20	33	89	15	3	2	162
	Female	12	26	98	32	9	4	181
63	Male	83	57	14	5	3	0	162
	Female	69	68	35	4	2	3	181
74	Male	19	54	78	9	2	0	162
	Female	4	43	111	14	6	3	181

THE APPLICATION OF A HIGH-GRADE INTELLIGENCE SCALE (AH5) IN IRAN

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SUMMARY. A Persian form of Heim's AH5, a high-grade group intelligence scale, was given to a representative sample of Iranian secondary school pupils (575 boys, 433 girls, aged 17–18 years). Iranian subjects as a group were found to score substantially lower than their British counterparts. Girls were inferior to boys on both verbal and non-verbal scales of the test and there were significant differences between the three fields of specialisation.

I.—INTRODUCTION.

TRADITIONALLY, cross-cultural studies of intelligence have tended to be limited to comparisons of children and uneducated adults from culturally deprived groups with norms taken from the highly developed industrial societies of the West (Anastasi, 1958; Tyler, 1965; Vernon, 1969). The tests used have necessarily been of a simple non-verbal nature depending mainly on the more primitive perceptual and motor elements of intellectual activity. The present study reverses this tradition by comparing the performance of a group of young Iranians preparing for professional occupations with British groups of similar educational standing and occupational aspirations. The test used is a high-grade group test which relies heavily on facts and skills associated with middle and higher education.

II.—METHOD OF ENQUIRY.

Subjects were 1,008 pupils, 575 boys and 433 girls, aged between 17 and 18 years, attending the 11th and 12th grades of seven secondary schools in Shiraz, the capital of the Southern Iranian province Fars. They were all Persian-speaking Iranian nationals, over 95 per cent being Muslims.

Iranian secondary schools, although much less restricted in their admission policy, are similar to British grammar schools in both objectives and outlooks. They represent the overwhelming form of middle education open to Iranian children and every one who successfully completes the six years of secondary education is theoretically eligible to enter a university. In practice, however, secondary school graduates have to sit a highly competitive entrance examination to get a university place.

The curriculum of secondary education falls into two equal parts. In the first three years, grades 7 to 9, all pupils receive the same kind of general instruction in arts, sciences and a foreign language. From the tenth grade the studies are divided into three main branches: literature and humanities; mathematics and physical sciences; and natural sciences and biology. These three branches correspond to various specialised courses at the university level. Although, theoretically, the choice of any branch depends on the pupil himself, only those with a minimum score in the main courses of each branch are permitted to enter that branch. Because of higher pay and status enjoyed by the engineering, medicine, and science professions there is a great deal of pressure, both social and parental, on the more intelligent pupils to opt for the mathematics and natural science branches. Moreover, the standards of teaching are better established and applied in these branches than in the literary branch. Although no objective study of the relative standing of the three branches in terms of intelligence is available, it would seem to be generally assumed that the most intelligent and serious students go to the mathematics and natural science branches, and that a sizeable proportion of those entering the literary branch do so not because of any particular talent or interest in arts and humanities, but because they were not able to follow any other outlet for their wish to finish secondary education and enter university.

The subjects of this study were chosen in a way to include representatives of all three branches in proportion to their number in the total secondary school population of Shiraz. The sampling was done in terms of schools with known intake areas so that they could be regarded as representative of the socio-economic background of the secondary school population of the city. The limited number of students attending literary sections and the smaller number of girls enrolled in the mathematics branch, however, rendered the full observance of the sampling procedure impractical. In these two cases, samples had to be taken whenever available regardless of the socio-economic status of their schools. Table 1 summarises the sex, grade and course distribution of the sample.

TABLE 1

DISTRIBUTION OF THE SAMPLE ACCORDING TO SEX, GRADE AND BRANCH OF STUDY.

Sex and Branch of Study		11th Grade	12th Grade	Total
Boys (N=575)	Mathematics	111	152	263
	Natural Science........	94	130	224
	Literature	38	50	88
Girls (N=433)	Mathematics	34	51	85
	Natural Science	110	144	254
	Literature	52	42	94
Total (N=1,008)	Mathematics	145	203	348
	Natural Science	204	274	478
	Literature	90	92	182
Grand Total..	All Branches	439	569	1008

The test was a Persian adaptation of the AH5, a group test of general intelligence designed for use with selected, highly intelligent subjects (Heim, 1968). The test consists of two separate parts of 36 problems each. Part I comprises verbal and numerical problems. Part II is made up of problems in diagrammatic form involving perceptual discrimination and reasoning. Although not factorially derived, AH5 closely resembles the hierarchical structure of g plus $v : ed$ and $k : m$ favoured by British factor analysts (Vernon, 1961).

In preparing the Persian adaptation, a deliberate effort was made to keep the Persian form as close to the original as possible. Only in the case of the 18 items of the ' verbal analogies ' and ' similar relationships ' of Part I the mere verbatim rendering of the original words was not sufficient, but a list of Persian equivalents had to be drawn up. This was tried on a sample of 80 university students and the 18 best discriminating items were selected for inclusion in the final version.

The test was administered in groups of 30 to 90 subjects following the standard instructions given in the manual. To ensure better co-operation and increase motivation, subjects were told of the basic resemblances between this test and those included in the university entrance examinations, and the importance of previous experience and practice in doing these tests was emphasized.

III.—RESULTS.

Table 2 summarises the percentile frequency distribution of the total test score for boys and girls separately. Table 3 gives the means and standard deviations of the three test scores separately for boys, girls and the two together. Table 4 presents the data in further detail according to the grade and branch of specialisation.

TABLE 2

CUMULATIVE PERCENTAGE FREQUENCY DISTRIBUTION OF THE TOTAL TEST SCORE FOR BOYS, GIRLS AND THE GROUP AS A WHOLE.

Score Limits	4–6	7–9	10–12	13–15	16–18	19–21	22–24	25–27	28–30	31–33	34–36	37–39	40–42
Percent below the upper limit:													
Boys	1·0	5·0	12·0	25·0	41·0	57·0	74·0	84·0	91·0	96·0	98·0	99·0	100
Girls	1·0	7·0	20·0	38·0	56·0	74·0	87·0	92·0	97·0	99·0	99·0	100	
Total......	1·0	6·0	16·0	31·0	48·0	64·0	79·0	88·0	94·0	97·0	99·0	99·0	100

Table 2 indicates both the fairly normal distribution of the total score and its limited range which is only from 5 to 42, the majority of subjects falling between the two limits of 12 and 29. Comparing the means of the whole sample on Parts I and II (Table 3), the two parts would appear to be of almost equal difficulty. Girls, however, have scored significantly higher on the Part I (verbal) aspect of the test ($z=4{\cdot}34$, $P<{\cdot}001$). The last column of Table 3 gives split-half reliability coefficients of the total score for boys, girls and the two together. These are derived by Flanagan's (1937) formula and take into account the variances of the two parts of the test. The last row of Table 3 presents reliability coefficients derived through Tucker's (1949) modification of the Kuder-Richardson Formula 20. They give rather cautious estimates of the internal consistency of the test. The low level of reliability is probably due to the heterogeneity of the test itself which makes the application of a technique based on internal consistency rather untenable.

Sex Difference : As Table 3 indicates, boys have scored significantly higher than girls on both parts of the test. The difference is particularly marked on the second (non-verbal) part of the test. While the latter point is in accord with the majority of Western findings (Anastasi, 1958; Tyler, 1965), the Iranian girls' lower total score is not wholly consonant with Western findings. The lower scores of Iranian girls are all the more striking in view of the fact that they represent a much better selected group in terms of both socio-economic status and academic potential. Due to the traditionally lower status and earlier age of marriage of women in this provincial society, only girls from educated middle and higher classes with outstanding academic records are likely to be allowed or encouraged to continue their secondary education to the level covered by this study.

TABLE 3

AH5 RESULTS FOR 1,008 IRANIAN BOYS AND GIRLS.

		Part I	Part II	I+II	$r_{I/II}$	Rel.*
Boys (N=575)	Mean	10·071	10·360	20·431	·479	·628
	sd	4·145	3·997	6·940		
Girls (N=433)	Mean	9·212	8·665	17·877	·494	·568
	sd	3·845	3·393	6·058		
t between boys and girls**		3·30	7·39	6·07	—	—
	P<	·01	·01	·01		
Boys and girls (N=1008)	Mean	9·702	9·631	19·333	·498	·620
	sd	4·042	3·842	6·693		
Reliability***		·762	·741	·820	—	—

* Reliability by Flanagan Formula.
** Two tailed test of significance.
*** By Tucker's modification of K–R formula 20.

TABLE 4

AH5 RESULTS FOR 1,008 IRANIAN SECONDARY SCHOOL STUDENTS ATTENDING THE 11TH AND 12TH GRADES OF MATHEMATICS, NATURAL SCIENCE AND LITERARY BRANCHES IN THE CITY OF SHIRAZ.

Branch		12th Grade			11th Grade			Total		
		Pt. I	Pt. II	I+II	Pt. I	Pt. II	I+II	Pt. I	Pt. II	I+II
Mathematics (N=348)	Mean	11·53	11·85	23·38	11·49	11·48	22·97	11·51	11·70	23·21
	sd	3·93	3·74	6·42	4·12	3·63	6·54	4·01	3·70	6·47
	N	203	203	203	145	145	145	348	348	348
Natural Science (N=478)	Mean	9·12	8·94	18·06	7·74	9·33	17·07	9·06	8·85	17·91
	sd	3·85	3·56	6·00	3·37	3·50	5·68	3·74	3·54	5·87
	N	274	274	274	204	204	204	478	478	478
Literature (N=182)	Mean	8·35	8·01	16·36	7·54	7·47	15·01	7·95	7·74	15·69
	sd	3·30	3·07	5·17	3·72	3·06	5·72	3·54	3·08	5·50
	N	92	92	92	90	90	90	182	182	182
Total (N=1008)	Mean	9·85	9·82	19·67	9·51	9·38	18·89	9·70	9·63	19·33
	sd	4·01	3·87	6·64	4·08	3·79	6·74	4·04	3·84	6·69
	N	569	569	569	439	439	439	1008	1008	1008

Table 4 reveals significant differences among the three branches of study which remain consistent over the two grades. Thus, as expected, the mathematics students would appear to be the most intelligent of the three groups, with the natural science and literary branches trailing behind them. The values of t are as follows: mathematics *versus* natural science, $t=14{\cdot}17$ ($P<{\cdot}001$); natural science *versus* literature, $t=4{\cdot}37$ ($P<{\cdot}001$). From Table 4 it would also appear that inter-grade differences vary with the level of ability, being virtually non-existent among the highly intelligent mathematics students but reaching their maximum with the least intelligent literary branch where it is significant ($t=2{\cdot}15$, $P<{\cdot}01$).

The efficiency of the AH5 in differentiating among the three branches of academic specialisation may be taken as a mark of its construct validity. Moreover, as part of the biographical data collected along with the test, subjects were asked about their previous failures. The proportion of past failure for the more and less intelligent halves of the sample, as defined by the AH5 results, was 33 and 53 per cent, respectively ($z=6{\cdot}57$, $P<{\cdot}001$). Thus, the test would seem to be tapping some ability with a definite bearing on educational attainment.

Comparing the results of this study with the British norms provided by Heim (1968), the Iranian subjects are found to have scored very low indeed. Their means are not only drastically lower than those of comparable British groups (e.g., 17- and 18-year-old grammar school pupils) but they are also significantly smaller than those of much younger age groups, i.e., 13- and 14-year-old grammar school boys. The overall means of these groups are 33·93 (sd=8·42) and 23·02 (sd=6·81) for 17–18 and 13-year-old boys, respectively. In fact, the overall mean of Iranian subjects falls within the grade E (bottom 10 per cent) of their British counterparts, and there is little overlapping between the two groups. Over 95 per cent of Iranian subjects fall below the grade B (upper 30 per cent) of the British 17–18-year-old norms.

IV.—DISCUSSION OF RESULTS.

In view of the paucity of evidence on both the Iranian students of the kind covered by this study and the outcome of the AH5 test with other non-western groups, little can be offered in the way of further explanation of these findings. Regarding the intelligence test performance of Iranian students, only one study is known to the authors. Valentine (1959) has reported on the performance of large groups of Iranian secondary school, college of agriculture, and would-be university students on Raven's Progressive Matrices. His findings are well in accord with ours. His sample of 120 medical students, for instance, who had already been selected on the basis of a test of academic achievement as well as a test of linguistic ability, scored only ' average ' in comparison with British norms and as many as 12 per cent of them attained less than 10 percentile points. Valentine also reports a sizeable sex difference in favour of Iranian boys. Working with a representative sample of illiterate Iranian villagers and tribesmen, Bash (1967, 1970) has found a similar sex difference on a simplified version of the Wechsler-Bellvue block design and arithmetic sub-scales.

The generally depressed test scores of Iranian subjects may be attributed to any of the host of possible reasons postulated by psychologists working with other socio-cultural groups (Vernon, 1969). Among the more obvious reasons one can think of are lack of test sophistication, slowness of reading, and the failure of the Iranian educational system to encourage the problem solving strategies required by Western-type intelligence scales.

For the majority of subjects, the study was the first opportunity to take a psychological test under strictly standardised conditions. As the majority of school examinations in Iran are of the conventional essay type, the subjects were confronted for the first time in their lives not only with highly abstract problems but also with a form of question and answer previously unknown to them. The necessity of using separate answer sheets for recording their responses was an additional hurdle totally foreign to their experiences.

Another handicap which is bound to have affected the test results of Iranian subjects is their marked slowness of reading and writing. The Iranian educational system has so far paid little attention to speed of reading and writing as such. On the contrary, the traditional concern of Iranian culture with writing as a form of artistic expression has tended to encourage the formal aspects of the skill at the expense of its communicative function. This same observation also applies to Persian language which too often tends to sacrifice accuracy and precision of meaning for the beauty of style and rhythm. The slow rate of reading among Iranian students is not only evidenced by the large proportion of unattempted items piling up towards the end of the test but is also clearly in evidence when Iranian subjects are asked to fill in untimed questionnaires. In this respect, Iranian subjects are similar to British rural groups studied by Smith (1948) and Moreton and Butcher (1963) and their lower test scores may be similarly explained by the slower tempo of life in traditional Iranian society. Although the AH5 is not basically a speed test, the allowed time may not be sufficient for the relatively slow-reading Iranian subjects.

A further, and perhaps more important, reason for the depressed scores of Iranian subjects may be sought in the basic nature of the educational process in Iran. Partly for historical reasons and partly for lack of qualified teachers, laboratories, and other means of practical instruction, the Iranian system of teaching has come to rely heavily on rote memorisation and verbatim transmission of 'facts.' Little attention is paid to the development of logical reasoning, analytical thinking, and the proper use of clear and precisely defined terms—skills so obviously relevant to the successful performance on the majority of intelligence scales. Moreover, the essentially authoritarian atmosphere of Iranian homes, which put a heavy premium on obedience and conformity rather than questioning and dissent, provides but little opportunity for the development of these thinking habits in an earlier age.

Much further research is needed before the relative contribution of each of these factors can be exactly determined. Some preliminary work in this direction is already under way and we have reason to believe that the lower test scores of Iranian subjects on the AH5 is best interpreted in terms of lack of test sophistication. Recent negative evaluations of American attempts to 'boost intelligence' of the culturally deprived groups notwithstanding (Jensen, 1969), we have cause to believe that an improvement in any of the factors mentioned above may lead to a definite increase in the measured intelligence of Iranian students.

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ON THE CONCEPT OF CRITERION-REFERENCED MEASUREMENT

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SUMMARY. The distinction between norm-referenced measurement and criterion-referenced measurement is discussed, particular emphasis being laid upon inter-subject variability. Three important areas of application are suggested: curriculum development; the assessment of developmental levels and the construction of diagnostic/remediation programmes. Psychometric issues surrounding the selection of criteria and suitable items are considered with reference to these and the possibility of individual item-sampling procedures is mentioned. It is considered that criterion-referenced test construction will require a change of emphasis from the assessment of individual differences to the identification of learning criteria and individual performance relative to these.

I.—INTRODUCTION.

OVER the last few years a number of psychometrists have suggested alternatives to the 'classical' approach to test construction exemplified in the writings of Gullikson (1967) and Lindquist (1966). Rasch (1966), for example, has introduced the concept of probabilistic scaling to the assessment of item difficulty and this method has been explored recently by Anderson *et al.* (1968). Eysenck (1967) argues for concentrating upon the parameters of the individual item and stresses the limitations of summed test scores, and indeed, statistical techniques which make use of derived parameters. The difficulties inherent in scaling qualitative data have led to various attempts to adapt Guttman's Scalogram technique in various areas of developmental psychology, e.g., Goldman (1965) and Wohlwill (1960). However, one of the more important recent psychometric developments has met with little interest at both practical and theoretical levels. This lies in the distinction, drawn originally by Glaser (1963), between criterion-referenced and norm-referenced tests.

Criterion-referenced measurement, as the name implies, is concerned principally with the individual's ability to perform at tasks representative of some explicit criterion. The issue is, therefore, whether the subject has or has not mastered the criterion behaviour; whether his standards are better or worse than those of others may be largely immaterial. Simple examples would be those of the criterion tests built into programmed instruction and which have to be passed at a satisfactory level before proceeding to the next section. Teachers have, of course, used informal tests of this type for diagnosis and evaluation but some of the wider implications of the method have only recently been recognised; in particular Popham and Husek (1969) have contributed a timely and provocative discussion of the topic. The purpose of this paper is to suggest some possible areas of application for the criterion-referenced approach and to develop further some of the points made in the literature as to its psychometric characteristics.

II.—THE CRITERION TEST.

Popham and Husek (*op. cit.*) maintain that the principal psychometric difference between the criterion and norm-referenced test is one of item variability. In conventional test construction the assumption is made that the individuals who are to be measured vary demonstrably in their possession of traits, proficiency in task performance, or knowledge of some body of subject matter. They can, therefore, be differentiated meaningfully and the statistical techniques of item analysis and selection are deployed to maximise these differences. From the results thereby obtained predictive decisions about particular individuals are made, usually in the context of selection for specialised forms of education or in vocational guidance. Sometimes, of course, tests can combine both criterion measurement and differentiation : grade levels of shorthand or typing competence which depend on the number of correct words per minute achieved are examples ; in physical education and athletics wide use is made of the qualifying standard. Mostly, however, it is unnecessary for variability to be built into a criterion-referenced test, for the basic question is " can this individual pass items which sample the criterion behaviour ? " Certainly the test constructor is interested in how many subjects pass a particular item but a different philosophy may be apparent, the orthodox psychometrist looking anxiously for facility values of 50 per cent, whilst the educationalist who has expended much time and effort on a basic instructional programme may be hoping for values of 100 per cent.

III.—SOME POSSIBLE USES.

Having drawn this distinction, it seems to the writer that a wide variety of situations exist which would justify experimentation with a criterion-referenced approach. However, three areas are suggested as being of outstanding general interest. These are (*a*) curriculum evaluation of the type suggested by Bloom and his associates ; (*b*) the sampling of developmental levels in cognitive growth and (*c*) the construction of tests for diagnostic/remediation programmes in special education.

(*a*) *Curriculum Evaluation.*

The taxonomic methodologies outlined by Bloom *et al.* (1956) and Krathwohl *et al.* (1964) involve the conceptualisation of hierarchies of educational objectives in which each successive level implies what has gone before. For the ' Cognitive Domain ' six important levels are postulated. These are knowledge, comprehension, application, analysis, synthesis and evaluation, each of which is sub-divided into levels of increasing abstraction. There is no doubt as to the considerable heuristic value of the approach. Sumner (1968), for example, relates both Cognitive and Affective Domains to the curriculum objectives of craft education and proposes a similar taxonomy for the Psychomotor, the whole promising a comprehensive and logically ordered technology of evaluation. Unfortunately, however, despite its many advantages, the practical application runs into a number of serious obstacles, those surrounding the choice of the criteria or objectives being the most intractable. For it would seem that with increasing levels of abstraction both agreement on and, indeed, measurement of, criteria become progressively more demanding. It is one thing for educationalists to agree upon necessary basic facts, another to agree upon criteria of synthesis or evaluation. Matters are further complicated by the fact that at high levels of subject complexity ' facts ' *per se* may involve several levels of the taxonomy and thus a precise definition of what a particular item measures may be extremely difficult to achieve. In any event the actual process of evaluation may introduce elements which are foreign to the spirit of the curriculum ; Atkins (1968) points out how these may prejudice the appraisal of revolutionary methods of science teaching and certainly the element of self discovery which seems to be involved in Nuffield-type teaching projects almost defies measurement.

Some of these issues are initially non-psychometric in nature although it may well be that the choice of educational objectives may depend eventually upon the feasibility of measurement, a point of obvious contention taken up forcefully by Atkins (*op. cit.*). However, where an instructional programme contains realistic and measurable criteria it may be possible to conceive of stages or response levels which will sample them directly and upon which an acceptable consensus of agreement may be reached among both educationalists and test constructors. It is not suggested that the adoption of such criteria will greatly simplify item construction as items of this type may be equally or even more difficult to design, but at least some limitations of the taxonomic approach may be avoided if items are eventually selected on the basis of their criterion sampling efficiency and not variability of response. Since the content analysis ideally contains clearly identifiable levels of ascending difficulty, variability should follow naturally and inevitably, students being differentiated on the basis of relative criteria accomplished.

(*b*) *Developmental Levels.*

Though most psychometrists pay tribute to the breadth and originality of Piaget's work on cognitive growth, the methods used have proved extremely resistant to handling in terms of orthodox test construction. And whereas a substantial proportion of the Genevan experiments have been successfully replicated, e.g., Lovell (1960), there has been a noticeable dearth of instruments inspired by the ' clinical ' approach yet constructed upon the usual lines. It is true that individual items and item series have appeared in group test form occasionally, but these appear somewhat artificial in the two dimensional format: pictures of water levels, however well drawn, do not possess the same appeal as the real thing. Most work is aimed at obtaining descriptive data for age levels with a view to establishing the sequence of ' stages ' although interesting ' test ' batteries have been produced (e.g., Laurendeau and Pinard, 1962), a long awaited developmental scale, c.f. Vinh-Bang (1957), has not yet appeared in its final form. The merits and demerits of Piaget's logical model are still strenuously debated but by now the psychometric hazards of clinical enquiry are well established, although this does not imply criticism of the essential validity of the method. Typically it requires a stimulus upon which the subject can impose an idiosyncratic mode of solution representative of his general level of cognitive development. It may be therefore, excessively sensitive to intra-and inter-subject variability so that a reliable psychometric adaptation demands a compromise between flexibility and more formal aspects of measurement; a severe challenge to test construction.

To some extent the latter has been taken up in the design for the new British Intelligence Scale (BIS), which has a rationale based on the sampling of content areas from both factorial and developmental sources (Warburton *et al.*, 1970). Here items have been written towards a prospective cognitive profile, each ' factor ' or sub-scale being composed of up to three sub-tests affording differential approaches to testing the hypothetical ' special ability ' concerned. The BIS is developmental in that its age coverage is from 2 to 16 years, but in four sub-tests items developed from experimental work have been incorporated to investigate theoretically crucial areas of children's thinking. Examples of these are items which measure concepts of conservation in various forms, class, inclusion, classificatory logic and combinatorial thinking at the formal operational stage. Now it is clear that a good proportion of these will be satisfactory on all counts, whether they are evaluated on psychometric/factorial grounds or for ease of administration and clinical richness ; it has been known for very many years (e.g., Burt, 1909) that tests of higher mental processes load highly on the general factor of intelligence. Equally obvious, however, is the fact that many items which psychologists would regard as effective developmentally will not be acceptable on other grounds, such as poor discrimination or inability to fit into a factorial model. One might speculate, therefore, that within a test such as the BIS there might be room for two distinct psychometric approaches, the one involving orthodox procedures within a factorial framework, the other concerned with sampling developmental criteria without reference to detailed issues of age scaling or differentiation. This might be accomplished by inserting ' key ' items at intervals within the main scale. Should a subject fail or perform atypically on one or more of these a more detailed enquiry could be made, using a variety of items to establish representative levels of response. This qualitative investigation could involve additional material of the orthodox type together with more flexible modes of questioning.

However, once again the choice of suitable criteria is the principal difficulty and in a sense the problems in this area are more complex than those in curriculum development since whole aspects of cognitive growth rather than specific educational issues are involved. Sampling Piagetian ' groupings ' or broader developmental levels would be possible up to a point although many psychologists would deny that children's thought processes are organised in this way and would argue that the model does not possess sufficient stability for testing purposes. A restricted yet perhaps more generally acceptable approach might be to postulate limited criteria in the form of groups of logical operations which appear to have important generalisability. These may be thought of as ' schemata ' in the sense that Skemp (1962) uses the term or ' advance organisers ' (c.f. Ausubel 1968) which will permit operations to be carried out upon a range of new material. One such ' logical ' group might be that based on the 16 binary propositions of ' p ' and ' q ' (Piaget, 1949) which generates a number of propositional transformations and has formed the rationale for a logical game proposed for the BIS, although, perhaps, a more realistic method would be to be restrict this to one logical operation such as implication or negation, which could be investigated in a range of different settings.

(c) *Diagnostic/Remediation Programmes.*

For some considerable time now workers in the field of special education have expressed dissatisfaction with the global cognitive measures obtained from such tests as the Stanford-Binet and the Wechsler Intelligence Scale for Children (e.g., Phillips, 1968). The demand is clearly for diagnostic profiles which will spotlight intra-individual differences and which can lead to on specific remediation programmes. This has motivated the construction of the Illinois Test of Psycholinguistic Abilities (Kirk *et al.*, 1968) and the Frostig Developmental Scales of Visual Perception (Frostig *et al.*, 1964), and the development of these instruments has proceeded with continual reference to their future educational use (e.g., Bateman, 1965). Accompanying the growth in the number of similar tests has been a tendency to disregard their normative aspects and to concentrate on the special characteristics of the population under scrutiny and this has certainly been the case in both factorial and evaluative types of research (e.g., Baumeister *et al.*, 1962). Therefore, in the area of special education there is a discernible movement away from the population-based type of predictive measurement towards idiographic enquiry and the detailed educational implications of a test result for the individual subject, the logical consequence being the convergence of measurement technique and programme formulation. In some specialised areas this will lead to advanced techniques based on operant conditioning, but will nevertheless require a close analysis of criteria in the manner already described and will apply importantly to such areas as the education of deaf or language disordered children where it is being realised that a close relationship between assessment procedures and curriculum objectives is necessary.

In the areas of reading and arithmetic a number of loosely formulated criteria have been employed traditionally, certain levels of work-recognition, for instance, being taken to imply mastery of component skills. However, much work with individual children suffers from the lack of knowledge of how component skills are weighted in the overall performance ; although many writers, (e.g., Daniels and Diack, 1965 ; Roberts and Lunzer, 1968), have been interested in such an analysis.

Likewise, a field where measurement difficulties are by now well known, if not notorious, is that of compensatory education or cultural enrichment in which language acquisition programmes figure prominently, and in which the usual problems of testing extreme or deviant groups are compounded by the choice of measurement instruments which provide norms derived from general populations of children. Many programmes of the ' Headstart ' variety are based upon the provision of a stimulating environment in the linguistic and material sense, the assumption being made that within this framework generalisable cognitive skills will develop. Yet as has been forcibly argued by Bereiter (1966) and others, the optimal result may be gained from intensive training in specific language and visuo-motor skills, a method more suited to criterion-referenced than norm-referenced testing since the reliability, let alone predictive validity, of the latter with pre-school children is very limited.

IV.—CRITERION SELECTION.

A major criticism of conventional tests is that in the majority of cases their content validity is difficult to establish despite the fact that some account of a test's content validity is regarded as an essential aspect of the presentation (c.f. APA, 1954). By this it is assumed that it is possible to define objectively the extent to which a test samples the universe of behaviours it is designed to predict, and thus content and predictive validity may be intimately related. However, this relationship varies from test to test ; the predictive validity of such instruments as the Stanford-Binet stems mainly from the fact that, broadly speaking, children who are ahead of their peers at any particular age level tend to retain some of the advantage, and, similarly, those who are retarded will remain so. When a test involves a criterion as the direct focus of item content an intermediary stage has been interposed between item and the ultimate predicted behaviour, and it is now the criterion's validity which is under scrutiny ; a rather different procedure from first constructing the test and then validating it against an external criterion. In a sense, therefore, the ' test ' is omitted in the latter approach.

The precision with which criteria may be formalised depends of course upon the subject matter. For instance, in craftwork there exists a reasonably obvious hierarchy of component skills, such as ability to read a plan, measure accurately and control a range of tools. The possession of these implies the capability of executing an infinite variety of constructional projects, each of which would present specific problems of assessment, for viewed as a totality the criterion may be far more difficult to assess than any component, however crucial. Conversely, the criterion may be perfectly well agreed upon, as in the case of a reading test, but an acceptable analysis of component skills may not exist. Criterion levels which are inferred from the quality of the subject's response over a representative sample of problem situations are concerned with abstract forms of cognitive skill and their ultimate generalisability may be correspondingly difficult to establish.

V.—ITEM SELECTION.

Given that theory is acceptably definitive and objectives clearly explicit a number of existing types of item may be worthy of further exploration for purposes of criterion-referenced measurement. The first is conventional in that only a person who has learned this section of the required behaviour can pass the item : at the simplest level, recall of a specific piece of information, at more complex levels the solution of problems requiring knowledge of a scientific principle are obvious examples. A second variety is less common although similar items have a very long history. This is the situation in which a single stimulus is used to evoke differentially scored levels of response as in the ' Vocabulary ' and ' Similarities ' sub-tests in the Wechsler Scales. The principle has been developed further in the procedure described by Peel (1966) which is of great relevance to the assessment of stages in children's thinking. Here the subject is given and is questioned upon a short passage which is so constructed as to give rise to qualitatively different types of answer.

Peel's items stimulated the production of a whole series of what might be termed ' Social reasoning ' items for the try-out version British Intelligence Scale, e.g., " Some people I know say that they treat all their children exactly the same. Do you think that this is possible ? " Preliminary results from such items are extremely promising although, as the items are administered over wide age ranges, non-cognitive elements inevitably creep in, as is shown by the following response typical of pre-school children : " No, my older brother got the train set I wanted." However, a fairly well differentiated range of responses is produced overall. At the lowest level pre-logical or tautologous thinking is evident such as " Yes, because they treat them all the same." A more reasoned type of answer recognises the absurdity of the statement but remains somewhat egocentric, e.g., " No, because all the children wanted different things : I wanted a doll and my sister wanted a blackboard." With adolescents the responses often introduce conditionals, the more advanced sometimes including attempts at compromise : " No, in the sense that it is impossible strictly speaking, but it may be true in that by " all the same " they mean that they are doing their best for every child."

A rather different approach is suggested by Wood (1968b) in the form of the ' tailored test.' Wood regards the conventional test as inefficient since due to sampling heterogeneity much of the information obtained from responses is redundant. Poor candidates tend to guess when in difficulties and superior candidates may have to work through what for them is a trivial and undemanding set of items. In the tailored test an attempt is made to programme subjects through the test so that they are working at items within or at the edge of their problem-solving capacity ; thus, the level of each succesive item depends upon the quality of previous responses. The procedure has an obvious affinity with ' branching ' in programmed instruction upon which it is largely based, and in this context issues of step size and item difficulty are more or less synonymous. Wood considers that the best technique consists of graduation of step size as the test progressively differentiates the individual subject. The great advantage of this form of test seems to lie in the opportunity it affords for a truly qualitative investigation of response over and above any estimate of general level. Viewed in this way the statistical problems and scoring anomalies mentioned by Wood seem less important and, as is pointed out, tailored test items may be much more relevant to the assessment of individuals at the extremes of the range of ability.

The needs of public examinations such as the Certificate of Secondary Education, have stimulated considerable interest in the application of Bloom's Taxonomy to item construction, and the possibility of future item banks (cf. Wood, 1968a) may mean that large numbers of items based upon the approach will be available for criterion-referenced testing. Most work thus far has been aimed at the production of items of good conceptual quality and known psychometric characteristics, although it will be unfortunate if discrimination indices entirely determine the selective process. Hall (1969), for example, tried out six types of item format and concluded that ' matching ' items produce the best discrimination at the 'Application ' level of the taxonomy. Here the subject is provided with a series of correct answers and is then required to match them to the appropriate problem. Among others the following example is quoted from B.Ed. examinations :

> " Which of Freud's defence mechanisms (*a*) reaction formation, (*b*) projection, (*c*) compensation, (*d*) withdrawal and (*e*) displacement, would best describe the following situations. Insert the appropriate letter in the space provided.
>
> " (1) an autistic child
>
> " (2) a teacher who condemns smoking to cover up his own craving, etc., etc."

Hall considers that this type of item possesses the distinct advantage of offering a concept at a high cognitive level and then asking the subject to apply it to new situations. The matching item is, therefore, very suitable for criterion referenced measurement in that its generalisability is readily apparent. Like other writers, however, Hall stresses the problems of constructing items for the synthesis and evaluation levels, and speculates that these may be more effectively tested by traditional methods.

VI.—STATISTICAL CONSIDERATIONS.

At several points in their discussion Popham and Husek (*op. cit.*) mention the limitations of orthodox methods of item evaluation and even refer to the possibility of retaining items with negative discrimination indices in some circumstances. Intuitively, however, the ideal item for a criterion referenced test would seem to be one which only the subject who has mastered the criterion can pass (thereby eradicating false positives ; false negatives do not seem quite so serious). However, the issues involved are far from simple since it may well be that some types of item work best in groups and in any case discussion of acceptability will include such considerations as whether the subject has a choice of questions, and indeed, whether every subject has to pass the same number of items in order to pass the criterion. The flexibility of the method means that a criterion test is personalised in a very real way and thus the situation is far from the idealised case in which every subject attempts exactly the same items, and in order to pass them uses the same mental processes. Other normative problems may be raised by such questions as " What proportion of the items does the subject have to pass in order to satisfy the criterion ? " and " What is the minimum number of items necessary for sampling purposes ? "

All the above considerations will, of course, affect estimates of reliability since what we have now is a large number of short tests using different items and numbers of items which may not appear in any particular order of difficulty. Moreover, most worthwhile criteria will be multi-factorial. Reductions in item variance will inevitably mean that estimates of internal consistency will be low; the extreme case is where every subject passes the test, and use of the Kuder-Richardson (KR 20) formula would result in an indeterminate coefficient value. Indeed, the whole question of testing error is highlighted by the criterion-referenced measure; in additional to the usual components of individual variation presumably the extent to which an item reflects a criterion is subject to variation, and where differential scoring methods are used some error variance will centre around interpretation; added to normal intra-subject, and in the case of individual testing, inter-examiner variance, these can summate to considerable amounts of error. Tailored testing and the use of criterion-referenced testing for repeated measurement of the individual case will certainly lead to a demand for alternative, more flexible, statements of reliability such as the ' generalisability ' theory proposed by Cronbach *et al.* (1963), which would allow for the non-equivalence of such measures. This formulation has a direct application to the present purpose since it requires the investigator to describe unambiguously the " universe of conditions of observations over which he wishes to generalise." Since a set of test observations might relate to any number of possible ' universes ' the precise one under scrutiny must be stated. In their account these writers distinguish between the study of generalisability (G. Study) and that of decision (D. Study), the former being undertaken to evaluate the measure, the latter providing information about groups or individuals. A range of appropriate coefficients is described but it is considered that the most important function of reliability study lies in estimating and reporting variances in detail, leading to a much more systematic examination of measurement error.

The adoption of criterion-referenced tests with restricted variability will mean that conventional statements of the various types of validity will be impossible to obtain from the use of correlational analysis. Most estimates of validity will, therefore, centre round educational/psychological judgments as to the effectiveness with which an item or test samples a criterion, although normative data will be required in order to establish necessary and sufficient levels of the criterion in order to predict future behaviours—one thinks of remediation and compensatory programmes particularly here.

VII.—CONCLUSIONS.

The above has attempted to publicise what is basically a different philosophy of measurement although most of the points raised here are familiar in other contexts. Norm-referenced tests are commonly used for criterion purposes; the point is worth making, however, that it is the test user rather than the constructor who postulates criteria in terms of score obtained. If criterion-referenced tests are to pass into widespread use (as opposed to their restricted use in programmed instruction) a host of important general psychometric issues will have to be resolved, although it is hoped that many potential advantages of this approach will have been implicit in the foregoing discussion. To these may be added a number of not inconsiderable indirect benefits. Chief among these is that from the standpoint of eventual test utility the ball is fairly and squarely in the court of the consumer of the test result who has to specify what his programme has to offer. Since variability may be less important the need for large, precisely compiled samples may be obviated, an attractive feature for educationalists working in fields of continual curriculum change or for workers in specialised educational areas where concepts of normality are less crucial. The investigating psychologist will move towards a much more educationally systematic approach to the assessment of qualitative differences in functioning and by far the most important implication of the use of criterion measurement for the practice of clinical or educational psychology is that it may divert psychometric attention away from the concept of individual differences. Thus, in these areas assessment may be guided towards what the writer feels are the most important aspects of future psychological work: the identification of meaningful learning criteria, and the accurate assessment of the individual subject's performance with respect to these. There will always be a need for norm-referenced measurement and the development of more powerfully discriminative tests. However, this must be paralleled by the provision of a wide variety of methods of qualitative enquiry and in this criterion-referenced tests may come to play an extremely important role.

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LINEAR EQUATIONS FOR ESTIMATING A PERSON'S OCCUPATIONAL ADJUSTMENT, BASED ON INFORMATION ON OCCUPATIONAL PROFILES

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SUMMARY. There are broadly two models for vocational guidance, estimating respectively the ' efficiency ' of the individual against a performance criterion and ' belongingness or adjustment ' based on similarity to the typical member. The former has attractions of positiveness, but data for the latter are easier to get.

It is shown in this paper that, with certain reasonably acceptable assumptions, mean occupational profile data can be used via the point-biserial to get regression equations permitting the more convenient usage of the ' efficiency ' approach (though the criterion is still ' adjustment '). An illustrative example is worked, discussion is given of how the proposed ' adjustment score ' functions, and a tentative decision rule is stated.

I.—INTRODUCTION.

VOCATIONAL guidance can proceed, broadly speaking, from either effectiveness or adjustment estimations (Cattell, 1957). In the former we have the benefit of possessing some criterion of success in an occupation, and thereby calculate the weights in a multiple regression equation, usually linear, to be applied to an array of personality and ability measures on the individual. In the latter we have no direct measure of effectiveness but know only the ' type ' of person who tolerates and is tolerated by the occupation, as evidenced by his having stayed adjusted in it for a suitable length of time.

Using the adjustment method, it has been customary to obtain some index, e.g., r_p (Cattell, 1949, 1969) or a discriminant function score (Tatsuoka and Tiedeman, 1954; Tatsuoka, in press) of the extent to which the given individual seems to ' belong ' to the group for which a mean profile of adjusted members is available. For many psychologists—and probably most psychometricians—the multiple regression equation, with its estimation of a positively known ' effectiveness ' criterion is somehow preferable. However, it has been pointed out by Rulon and others (1967, Chapter 9) that the practice of predicting a given individual's potential ' effectiveness ' in each of a variety of occupations by using a number of regression equations (one for each occupation)—if uncritically followed—is rather unsound. For one thing, each regression equation has been constructed on a sample of members of a particular occupation, and, hence, cannot be validly applied to an individual who is not known to be a member of the same population. To be sure, this objection loses much of its force when the range of occupations considered is so restricted that members of all of them may be regarded as having been drawn from a single ' super-population.' But in this case a different objection becomes germane. Namely, the sub-populations supplying the various occupations within this ' family ' are quite likely to form a hierarchy in terms of some specific (or general) ability dimension. When this is true, it can be shown that the regression-equation approach tends to oversupply the less demanding occupations in the family, and undersupply the more demanding ones.

The foregoing considerations lead to the suggestion that the proper framework within which vocational guidance should operate must consist in some sort of combination of the adjustment and ' effectiveness ' approaches. Indeed, there is little doubt that the practising vocational-guidance counsellor does precisely this, i.e., he effects an intuitive ' weighted combining ' of the information obtained from the two approaches (or informal substitutes for these, based on his own experience and educated opinion). But an objective method for effecting such a combination does not appear, as yet, to have been tried out in practice. One proposal along these lines has been made by Tatsuoka (1956 ; also in Rulon *et al.*, 1967, Chapter 10) which consists in computing the " joint-probability of membership and success in an occupation."

However, it is a sad fact of our organisation of vocational-guidance research that ' effectiveness ' information is lagging far behind ' adjustment ' information. For every instance where research has provided weights on primary personality and ability factors against some more or less valid criterion of success within an occupation, there are probably half-a-dozen where all we have is a statement of the mean personality-ability profile of people who are simply ' adjusted ' to the occupation by evidence of remaining in it. Thus, on the primary personality factors as measured in the 16 PF test, for example, there are discovered weights against effectiveness criteria for only about six or seven occupations (e.g., the sales volume of retail salesmen) while profiles on intelligence and personality factors exist for about 40 occupations (Cattell, Eber and Tatsuoka, 1970).

Even granting that diligent work with primary personality, ability, and motivation factors should gradually come to offset the imbalance noted above (Cattell and Butcher, 1968), the problem would still remain of how we can objectively, and without exorbitant computational effort, combine the information from the two sources. The trouble with Tatsuoka's original (1956) proposal is that it calls for an inordinate amount of computation (even with the aid of a large computer) when the number of occupations considered becomes large—say 10 or more. An examination of his joint-probability index reveals, however, that the essence of what it does is this : It *weights* the probability of ' success ' in various occupations (as obtained from the regression-equations approach) by the probability that the given individual is, indeed, a member of the population supplying each occupation with its personnel (as estimated from a multiple discriminant analysis). That it does so in such a manner that the product of the two probabilities can be regarded as a joint probability of ' membership-and-success ' is theoretically satisfying but, in practice, unnecessary.

Once we abandon our insistence upon theoretical ' elegance ' (bought at the cost of practical infeasibility !), a whole new vista is opened up. No longer do we need to construct the several regression equations and carry out a single grand multiple discriminant analysis on umpteen occupational groups, using the same set of predictor variables for the regression and discriminant analyses. Any approach yielding a more or less valid estimate of a given individual's probability of ' belonging ' to the population of the members of each occupation will suffice. We would then multiply the individual's probability of ' success ' in each occupation by his estimated probability of ' belonging ' to the relevant population and obtain a *weighted probability of ' success.'*

It is for the purpose of describing a start made in the direction of estimating probabilities of group membership in a feasible, piecemeal fashion (rather than from an impractical, grand-scale multiple discriminant analysis) that this paper is written. Several problems remain, as mentioned in the discussion below, and these will be considered in a subsequent paper. In the meantime, even apart from the goal of estimating these probabilities, it is believed that the method proposed herein provides a new, useful way for making quantitative estimates of the 'degree of adjustment' a given individual will probably enjoy in a particular occupation ; hence the title of this paper.

II.—DERIVING THE ESTIMATION EQUATION.

The approach we propose to take for estimating adjustment (and, eventually, for estimating probabilities of group membership) is to construct a multiple point-biserial regression equation. This, in itself, is nothing new. In fact, Fisher (1936), in developing his discriminant function for differentiating between two populations on the basis of a set of measurements on a sample from each population, showed that the optimal combining weights for the predictor variables are proportional to a set of partial regression weights. The latter are obtained by introducing a 'dummy criterion variable' Y, such that Y=1 for all members of the sample from population A, and Y=0 for all population B sample members. Point-biserial correlation coefficients are computed between the predictors and Y, and regular correlations are calculated among the predictors themselves. Then, using standard procedures for multiple regression, the partial regression weights, commonly called 'beta weights' for the several predictor variables are found ; these are used as the combining weights in a two-group (but *not* a multi-group) discriminant function.

What is new (so far as we are aware) in the current proposal is that the two populations we consider are *not* two disjoint classes (like the two varieties of iris, *Iris setosa* and *Iris versicolor*, which Fisher 'immortalised' in his 1936 paper). Rather, for each two-group discriminant function we construct, one population will be a particular occupational group, while the other will be the 'general population at large,' of which the former is necessarily a part.* This is an innovation.†

The deterrent against constructing 'part *versus* whole' two-group discriminant functions (or, equivalently, point-biserial multiple regression equations) lies in the apparent necessity of knowing what percentage of the total population a given occupational group constitutes. This is evidenced by the fact that the formula for the point-biserial correlation coefficient, in its 'part *versus* whole' version, reads as follows (see, e.g., Guilford, 1965, p. 323) :

$$(1) \qquad r_{pb} = \frac{\overline{X}_I - \overline{X}_t}{s_t} \sqrt{\frac{p_I}{1-p_I}}$$

where $\overline{X}_I$=mean X (predictor) score for a given occupational group (assigned Y=1 on 'dummy criterion').

$\overline{X}_t$=mean X score for total population,

s_t=standard deviation of X in the total population,

p_I=proportion of total population which this group constitutes.

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*Actually we are, in the final analysis, using two disjoint classes : the particular occupational group under consideration, and its *complement* in the general population (i.e., everyone except those in this occupation). However, all the parameters (and hence their sample estimates) are in terms of one occupational group or the total population. Therefore, we are justified (as a matter of emphasis) in calling this a 'part *versus* whole' discriminant analysis.

† We are aware, of course, that Strong (1943), in developing the weights for responses to items in his *Vocational Interest Blank*, used the general idea of 'specific occupation *versus* general population' discriminant functions. To our knowledge, however, he did not construct any actual equations.

It turns out, however, that we need to know p_1, as defined above, only if we wish to predict Y (the dummy criterion variable designating group member ship) in its original scale: $Y=1$ for a member of the occupational group in question; $Y=0$ for all others. If we adopt a standardised scale (such as the sten scale, with a mean of 5·5, and a standard deviation of 2·0), our dependence on p_1, surprisingly vanishes—at least temporarily. It reappears actually, in subsequent probability estimates, because we have to recognise that the standard deviation of the criterion estimate will now differ appreciably from one occupation to another. But, in the meantime, we have a useful estimate of the probable degree of adjustment of a given individual relative to other candidates, in a particular occupation.

For concreteness we suppose hereunder that the predictor variables are the 16 scales of the 16 PF test, which we denote by $X_1, X_2, \ldots, X_{16}$, or more compactly, as $X_i (i=1, 2, \ldots, 16)$. The (dummy) criterion variable Y_g is defined so as to take the value $Y_g=1$ for members of our sample from a given occupational group g; $Y_g=0$ otherwise. In Equation (1) for the point-biserial correlation coefficient, we omit the subscript t for the total population, replace 1 by g for the particular occupational group under consideration, and introduce i ($i=1, 2, \ldots, 16$) for identifying the predictor variable (16 PF scale). We then have

$$(2) \qquad r_{iy(g)} = \frac{\overline{X}_{ig}-\overline{X}_i}{s_i} \sqrt{\frac{p_g}{1-p_g}}\ ; \quad i=1, 2, \ldots, 16$$

for the point-biserial correlation between each X_i and membership in group g (which is fixed when constructing any one multiple regression equation).

Upon introducing the abbreviations

$$(3) \qquad \Delta_{ig}= \frac{\overline{X}_{ig}-\overline{X}_i}{s_i}$$

and

$$(4) \qquad w_g= \sqrt{\frac{p_g}{1-p_g}}$$

Equation (2) may be written as

$$r_{iy(g)} = \Delta_{ig}w_g.$$

We now denote the 16-dimensional column vector with elements $r_{iy(g)}$ by $\mathbf{R}_{y(g)}$, and similarly let $\mathbf{\Delta}_g$ stand for the column vector with elements Δ_{ig} ($i=1, 2, \ldots, 16$). The column vector of predictor-criterion correlations is thus given by

$$(5) \qquad \mathbf{R}_{y(g)} = \mathbf{\Delta}_g w_g.$$

Next, if we denote the 16×16 matrix of predictor intercorrelations r_{ij} ($i=1, 2, \ldots, 16$; $j=1, 2, \ldots, 16$) by $\mathbf{R}$ and the column of standardised regression weights $\beta_{i(g)}$ ($i=1, 2, \ldots, 16$) by β_g, we have, by standard procedures of multiple regression (see, e.g., Walker and Lev, 1953, Chapter 13),

$$(6) \qquad \beta_g=\mathbf{R}^{-1}\mathbf{R}_{y(g)} =(\mathbf{R}^{-1}\mathbf{\Delta}_g)\, w_g,$$

where we have used Equation (5) in the last step.

The beta weights given by Equation (6) are those that enter into the standard-score regression equation

$$z'_{yg}=\beta_{1(g)}z_1 + \beta_{2(g)}z_2 + \ldots + \beta_{16(g)}z_{16}$$

where $$z'_{yg}=\frac{Y_g-\overline{Y}_g}{s_{yg}}=\frac{Y_g-\overline{Y}_g}{\sqrt{p_g\,(1-p_g)}}$$

These weights do depend on p_g, the proportion of the general population that occupation g constitutes, as seen by the appearance of w_g in Equation (6). Likewise, the weights to be used in the raw-score regression equation,

$$Y'_g=a+b_{1(g)}X_2+\ .\ .\ .\ +b_{16(g)}X_{16}$$

will depend on p_g, for it is well known that, for each i,

$$b_{i(g)}=\beta_{i(g)}\,(s_{y_g}/s_i)$$

with $s_{y_g}=\sqrt{p_g\,(1-p_g)}$, the part that depends on p_g is

$$\sqrt{\frac{p_g}{1-p_g}}\,\sqrt{p_g\,(1-p_g)}=p_g.$$

There are advantages later (in making the comparisons among estimates of adjustment to different occupations) to having the weights rescaled so that the standard deviation of estimates is the same for every occupation. It is probably most convenient to bring all sigmas to 2, the value for sten scales, in the general population. So the predictor weights to be used in this improved regression equation

(7) $$Y'^{*}_g=a^*+b^*_{1(g)}X_1+b^*_{2(g)}X_2+\ .\ .\ .\ +b^*_{16(g)}X_{16}$$

are given by†

(8) $$b^*_{i(g)}=\frac{\beta_{i(g)}}{R}$$

where R (or, more completely, $R_{g\cdot\,1,\,2,\,.\,.\,.\,16}$) is the multiple correlation coefficient between the predictors and the criterion Y_g. But the multiple correlation coefficient is given by

$$R_{g\cdot\,1,\,2,\,.\,.\,.\,16}=\sqrt{\mathbf{R}'_{y(g)}\mathbf{R}^{-1}\mathbf{R}_{y(g)}}\quad ,$$

or, by substituting from Equation (5),

(9) $$R=w_g\,\sqrt{\boldsymbol{\Delta}'_g\mathbf{R}^{-1}\,\boldsymbol{\Delta}_g}\quad .$$

Upon substituting this expression and the i^{th} element of β_g (given by Equation (6)) in Equation (8). We find

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† This may be seen by writing the standard-score regression equation (in which we omit the subscript g for brevity) as:

$$\frac{Y'-\overline{Y}}{s_y}=\beta_1z_1+\beta_2z_2+\ .\ .\ .$$ and multiplying both sides by 2/R:

$$2\left(\frac{Y'-\overline{Y}}{s_yR}\right)=\frac{\beta_1}{R}\,(2z_1)+\frac{\beta_2}{R}\,(2z_2)+\ .\ .\ .$$

$$=\frac{\beta_1}{R}\,(2z_1+5{\cdot}5)+\frac{\beta_2}{R}\,(2z_2+5{\cdot}5)+\ .\ .\ .\ -5{\cdot}5\ \left(\frac{\beta_1}{R}+\frac{\beta_2}{R}+\ .\ .\ .\right)$$

The predictors are now in stens, and the predicted score has a mean of 0 and a standard deviation of 2 in the total sample, because the mean and standard deviation of $\overline{Y}$ are Y and s_yR, respectively. Finally, by adding 5·5 to both sides of the last equation, the predicted score is also expressed in stens; this is our Y'^* in Equation (7). The additive constant on the right-hand side becomes

$$5{\cdot}5\left(1-\frac{\beta_1}{R}-\frac{\beta_2}{R}-\ .\ .\ .\ -\frac{\beta_{16}}{R}\right),$$

which is a*.

$$(10) \qquad b^*_{i(g)} = \frac{(\mathbf{R}^{-1}\Delta_g)_i\, w_g}{w_g\sqrt{\Delta'_g\mathbf{R}^{-1}\Delta_g}} = \frac{(\mathbf{R}^{-1}\Delta_g)_i}{\sqrt{\Delta'_g\mathbf{R}^{-1}\Delta_g}}$$

in which p_g is not involved. (The symbol $(\mathbf{v})_i$ denotes the ith element of vector $\mathbf{v}$)

We thus have the convenient result that, provided the *predicted* criterion Y'_g is rescaled to have a preassigned standard deviation, the applicable regression weights are independent of p_g. For the sten-to-sten equation (7), the constant term is (see footnote † on previous page).

$$(11) \qquad a^* = 5{\cdot}5\left(1 - \frac{\beta_{1(g)}}{R} - \frac{\beta_{2(g)}}{R} - \ \dots\ - \frac{\beta_{16(g)}}{R}\right)$$
$$= 5{\cdot}5(1 - b^*_{1(g)} - b^*_{2(g)} - \ \dots\ - b^*_{16(g)}).$$

III.—A WORKED NUMERICAL EXAMPLE.†

As we shall see below, there may be need for a further step betore proper interpretation of an individual's score in relation to a decision among a set of occupations can be made. But it seems desirable at this point fully to clarify the first, main step by a numerical illustration. Accordingly, we shall now take four selected occupations for which mean profiles on personality factors are known, calculate the multiple point-biserial regression equations for them, and apply these to six candidates.

Table 1 shows, in the first four rows, the mean 16 PF profiles (in stens) for four occupations, as reported in the 16 PF Handbook (Cattell, Eber, and Tatsuoka, 1970); (1) High-school Teachers, (2) School Superintendents, (3) School Counsellors and (4) Social Workers.

The next four rows of Table 1 show the values of Δ_{ig} ($i=1, 2, \dots, 16$; $g=1, 2, 3, 4$) as defined in Eq. (3). The expression reduces to:

$$(12) \qquad \Delta_{ig} = \frac{\overline{X}_{ig} - 5{\cdot}5}{2}$$

in this example, because for each i, $\overline{X}_i = 5{\cdot}5$ and $s_i = 2$, by definition of the sten standardisation.

In the last four rows of Table 1 are found the regression weights $b^*_{i(g)}$ as computed from Eq. (10), and the additive constant a^*_g given by Eq. (11). (The correlation matrix **R** used in Eq. (10) was obtained by Cattell, Eber and Delhees (1968) in their cross validation study using a sample of size 606 from the general population). Thus, to write out the equation for group 1 (high-school teachers) in full, by way of illustration, we have:

$$(13) \qquad \begin{aligned} Y'_1{}^* = &-{\cdot}68X_1 + {\cdot}68X_2 - {\cdot}54X_3 - {\cdot}35X_4 + {\cdot}15X_5 - {\cdot}19X_6 + {\cdot}26X_7 \\ &+ {\cdot}18X_8 + {\cdot}12X_9 - {\cdot}02X_{11} + {\cdot}35X_{12} + {\cdot}01X_{13} - {\cdot}26X_{14} \\ &+ {\cdot}06X_{15} - {\cdot}86X_{16} + 11{\cdot}49 \end{aligned}$$

Table 2 shows the 16 PF profile, in stens, for six individuals. Using Eq. (13) and similar equations with constants as given by the last three rows of Table 1, we compute the predicted 'belongingness' or 'adjustment' score $Y'_1{}^*$, $Y'_2{}^*$, $Y'_3{}^*$, and $Y'_4{}^*$ with respect to the four occupational groups for each individual. Thus, for example, the predicted 'adjustment-to-occupation-1 score,' $Y'^{*}_{1(1)}$, for *S* No. 1 becomes, from Eq. (13),

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† We wish to acknowledge the assistance of Mr. Samuel E. Krug, who wrote the programs and carried out the computations reported in this section on an IBM 1130

$$Y'^{*}_{1(1)} = -{\cdot}68(10) + {\cdot}68(3) - {\cdot}54(5) - {\cdot}35(2) + {\cdot}15(3) - {\cdot}19(8) + {\cdot}26(6) + {\cdot}18(7) + {\cdot}12(8) + 0(2) - {\cdot}02(4) + {\cdot}35(5) + {\cdot}01(7) - {\cdot}26(4) + {\cdot}06(8) - {\cdot}86(8) + 11{\cdot}49 = 7{\cdot}00.$$

These results are shown, for each individual, in the last four columns of Table 2.

TABLE 1

CALCULATION OF MULTIPLE POINT-BISERIAL REGRESSION WEIGHTS FOR FOUR OCCUPATIONS (MALE SUBJECTS ONLY).

	Mean 16 PF Profile (Stens)																	
	A	B	C	E	F	G	H	I	L	M	N	O	Q_1	Q_2	Q_3	Q_4	(N)	
H.S. Tchrs.	4·4	7·1	5·2	5·3	5·4	5·1	5·3	5·8	5·6	6·0	5·4	5·8	5·9	5·6	5·2	5·2	177	
Sch. Sup'ts.	6·6	6·8	6·1	5·3	5·3	6·2	5·9	6·5	5·3	5·3	5·6	5·2	5·5	4·8	6·2	5·1	164	
Sch. Counsellors	6·9	7·0	6·1	5·5	5·4	5·2	6·0	7·1	4·1	4·7	4·7	5·0	5·1	4·7	5·6	5·2	154	
Soc. Workers . . .	8·0	6·6	6·1	5·9	5·2	5·1	6·3	7·2	4·2	6·0	5·7	4·7	6·2	4·2	5·5	4·8	81	
	$\Delta_{lg} = (\overline{X}_{lg} - 5{\cdot}5)/2$																	
H.S. Tchrs.	−·55	·80	−·15	−·10	−·05	−·20	−·10	·15	·05	·25	−·05	·15	·20	·05	−·15	−·15		
Sch. Sup'ts.	·55	·65	·30	−·10	−·10	·35	·20	·50	−·10	−·10	·05	−·15	·00	−·35	·35	−·20		
Sch. Counsellors	·70	·75	·30	·00	−·05	−·15	·25	·30	−·70	−·40	−·40	−·25	−·20	−·40	·05	−·15		
Soc. Workers . . .	1·25	·55	·30	·20	−·15	−·20	·40	·35	−·65	·25	·10	−·40	·35	−·65	·00	−·35		
	Regression weights ($b^{*}_{l(g)}$)																Con-stant	$\overline{Y}^{*}_{g}$
H.S. Tchrs.	−·68	·68	−·54	−·35	·15	−·19	·26	·18	·12	·00	−·02	·35	·01	−·26	·06	−·86	11·49	8·00
Sch. Sup'ts.	·36	·64	·29	·30	−·53	·18	·01	·51	·45	−·12	−·05	−·03	−·05	−·38	·37	·02	−5·32	8·07
Sch. Counsellors	·16	·44	−·12	·69	−·49	−·26	·03	·76	−·39	−·64	−·29	−·22	−·16	−·18	·12	·15	7·70	9·28
Soc. Workers . . .	·62	·25	−·06	·53	−·67	−·08	−·13	·41	−·20	·05	−·09	−·39	−·03	−·45	−·06	−·07	7·54	9·53

We may tentatively conclude that the six individuals show greatest 'belongingness' or 'occupational adjustment' to: (1) School Counsellors, (2) Social Workers, (3) Social Workers, (4) High-School Teachers, (5) School Superintendents and (6) School Superintendents, respectively.

TABLE 2

CALCULATION OF INDIVIDUAL 'ADJUSTMENT SCORES' WITH RESPECT TO FOUR OCCUPATIONS

16 PF Profile (Stens)																	Adjustment Scores (Stens)			
S No.	A	B	C	E	F	G	H	I	L	M	N	O	Q_1	Q_2	Q_3	Q_4	H.S. Tchrs.	Sch. Sup'ts.	Sch. Counsellors	Soc. Workers
1	10	3	5	2	3	8	6	7	8	2	4	5	7	4	8	8	7·00	·34	9·98	7·82
2	8	3	4	7	1	7	7	7	6	6	9	4	7	6	5	7	7·64	·11	7·87	10·47
3	8	2	4	1	3	3	5	5	3	3	1	3	3	4	3	5	7·63	3·24	2·23	8·30
4	5	4	7	3	1	7	3	7	3	2	3	8	5	5	6	5	9·27	4·75	7·18	7·05
5	4	10	4	2	4	4	5	6	3	6	9	6	5	5	6	6	6·32	11·15	6·17	5·51
6	9	8	4	6	9	3	8	7	4	8	5	5	8	6	6	3	6·26	9·10	5·45	7·30

IV.—PROCEEDING TO A DECISION FROM THE ADJUSTMENT SCORE.

In the foregoing we have referred to the scores Y'^{*}_{g} as predicted 'belongingness' or 'adjustment' scores, implying a monotone relationship between the magnitude of Y'^{*}_{g} and probable degree of adjustment. This requires some qualification. Theoretically, there is an upper limit such that further increases beyond this value do not prognosticate better adjustment; in fact, scores much higher than it may forebode poorer adjustment. The reason for this may be seen from Figure 1, which depicts a highly simplified situation involving only two predictors X_1 and X_2.

The large ellipse here represents the region within which practically all the points of the bivariate scatter diagram for the general population lie; the two small ellipses depict the corresponding regions for two occupational groups 1 and 2. The multiple point-biserial regression equation best differentiating members of each of these groups from the general population are

$$Y'_1 = -\cdot77 + \cdot30X_1 + \cdot84X_2$$

and

$$Y'_2 = 5\cdot5 + \cdot83X_1 - \cdot83X_2,$$

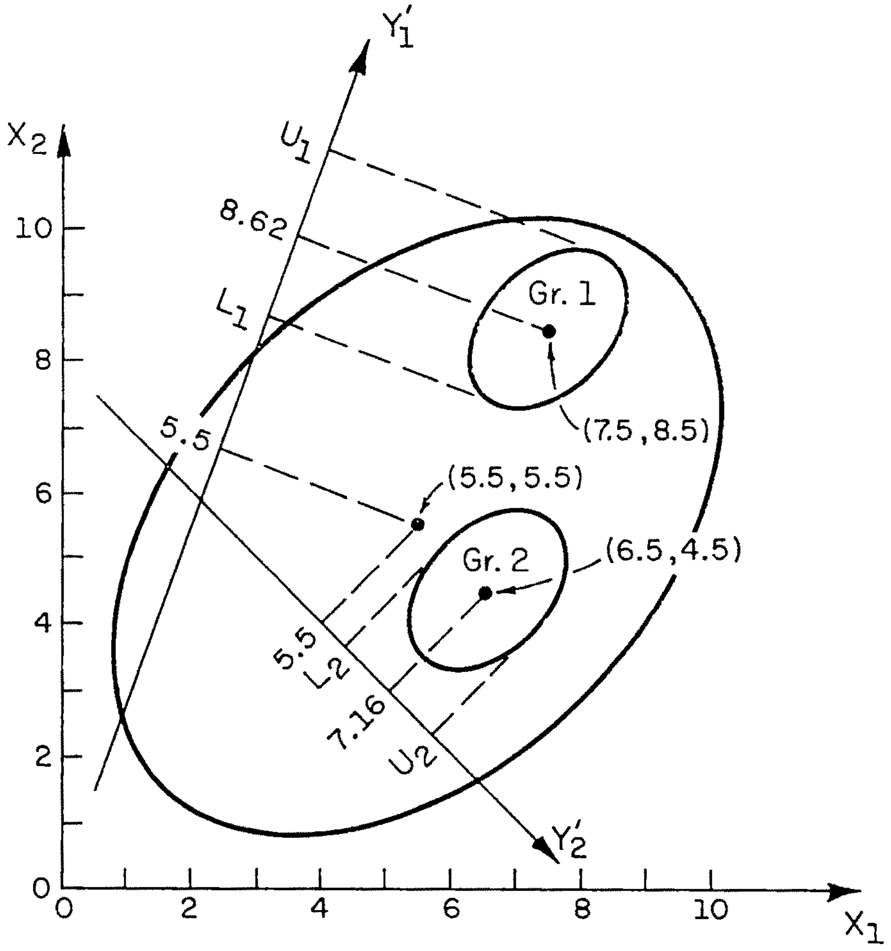
respectively. (To simplify the notation, asterisks are omitted here and subsequently.) These are represented in Figure 1 by the axes labelled correspondingly. The projection of the group 1 centroid (7·5, 8·5) on the Y'_1-axis represents the mean of Y'_1 for that group, which is

$$-\cdot77 + \cdot30(7\cdot5) + \cdot84(8\cdot5) = 8\cdot62.$$

The projection of the general population centroid (5·5, 5·5) on the Y'_1-axis determines the point on this axis with scale value 5·5, the general population mean on Y'_1. Similar remarks hold for the projections on the Y'_2-axis.

FIGURE 1

ELLIPTICAL REGIONS REPRESENTING SCATTER DIAGRAMS FOR GENERAL POPULATION AND TWO OCCUPATIONAL GROUPS.



In addition to the projections of centroids on the two axes, there are points labelled U_g and L_g ($g=1, 2$), at which the two tangents to the group-g ellipse that are perpendicular to the Y'_g-axis meet that axis. The scale values of these points may be taken, for all practical purposes, as the upper and lower limits of the Y'_g scores for members of group g. We thus see that, for each group, there is an upper limit U_g for the Y'_g score such that an individual scoring above this point is unlikely to be a member of that group.

Note, however, that the situation is rather different between groups 1 and 2, with regard to the percentage of individuals in the total population whose Y_1 and Y'_2 scores may be expected to exceed U_1 and U_2, respectively. Only a negligible percentage of people will earn Y'_1 scores exceeding U_1, because only a miniscule fringe area of the general-population ellipse lies above the tangent to the group-1 ellipse determining U_1. On the other hand, a considerable percentage of people can get a Y'_2 score in excess of U_2, because a fairly large portion of the general-population ellipse lies to the right of the tangent to the group-2 ellipse which determines U_2.

What are the characteristics of different occupational groups which make for differences like that between groups 1 and 2 above? Observe that group 1 is quite atypical of the general population in terms of its (X_1, X_2)-profile, with a centroid of (7·5, 8·5); its $\bar{Y}'_1$ mean is consequently quite large (8·62). Group 2, on the other hand, is not quite so deviant: its (X_1, X_2)-centroid is (6·5, 4·5), and Y'_2 mean is 7·16. This suggests that small, highly selected occupational groups (e.g., nuclear physicists, concert pianists, etc.), whose members are in some way quite deviant from the general population, will have high mean values of Y'_g, like group 1 above, whereas relatively unselected groups with very large memberships (e.g., elementary school teachers, clerical workers, etc.) will have relatively low values of $\bar{Y}'_g$, as in group 2 above.

These conjectures are borne out by actual data, reported in the latest edition of the 16 PF Handbook (Cattell, Eber and Tatsuoka, 1970). For instance, occupations with large $\bar{Y}'_g$ values include: research physicists (14·4), university professors (14·0), psychologists (13·6), psychiatric technicians (11·4) and performing musicians (9·7). Those with relatively small values of $\bar{Y}'_g$ include: policemen (8·7), clerical and secretarial workers (8·3), book-keeping clerks (8·1), high-school teachers (8·0), and elementary school teachers (7·9)

For high-$\bar{Y}'_g$ groups, the upper limit U_g will of course be even higher, and (as we have seen for group 1 above) only a negligibly small percentage of individuals will have Y'_g scores exceeding U_g. Thus, U_g will here impose only a gratuitous ceiling, and we may, for all practical purposes, regard Y'_g as a monotone increasing 'adjustment score' to these groups. For low-$\bar{Y}'_g$ occupations, like group 2 in our example, there may be a considerable number of individuals in the total population with scores greater than U_g. In these cases, however, there is almost bound to be another occupation, say k, such that an individual whose Y'_g exceeds U_g by a long shot will have a Y'_k score greater than $\bar{Y}'_k$ but less than U_k. He would then be predicted to become better adjusted in occupation k than in occupation g.

On the basis of the foregoing considerations, we may set out the following decision rule:

> Given a sufficiently large (ideally exhaustive) set of occupational groups, we may predict that an individual will be best adjusted in the group for which his Y'_g score is largest, *subject to the restriction* that it is not excessively greater than the mean Y'_g score of that group.

This is admittedly a crude rule in that it does not specify *how much greater* is to be regarded as 'excessively greater' than $\bar{Y}'_g$. One way to eliminate this ambiguity would be to tighten the restriction from 'not excessively greater than' to 'no greater than.' However, this involves the assumption that the 'average member' of the occupation is the 'ideal type,' which is probably not true. More plausibly, the person who is somewhat more deviant from the general population in the right direction (i.e., in the direction of larger Y'_g) is a better adjusted member of the occupation; hence the need to allow the Y'_g score to be somewhat, but not excessively greater than $\bar{Y}'_g$. A refined decision rule giving the upper limit would necessitate, among other things, our taking into account the relative sizes of the different occupational groups. Pending further work toward such a refinement, we believe, for reasons given in the preceding paragraph, that the rule stated above is adequate for most practical purposes.

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RESEARCH NOTES

THE USE OF NOTES IN EXAMINATIONS

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SUMMARY. Two randomly selected groups of mature social work students were examined under conditions of access or non-access to notes. The first condition was associated with less distress than the second. These conditions were not related to academic performance in a simple way, but there was a strong interactive effect between them and the results on particular examination papers.

I.—INTRODUCTION.

This experiment arose out of discussion among staff and students about the purposes and nature of assessment procedures on professional social work courses. It was agreed that testing the ability to recall information was not an important component of such procedures, and that they should be minimally distressing to the candidates. It seemed that both considerations might in some way be met by allowing candidates to use certain reference material in the examination situation, but there was no clear evidence available on the probable effects of this innovation. Perhaps the most relevant previous work had been undertaken by Feldhusen (1961) with students in a teacher training college. About two-thirds of his subjects considered that access to reference sources in examinations reduced both tension and memorization and most preferred this type of ' open book ' examination, although it did not produce any significant difference in their academic performance.

With the aim of reducing the uncertainty about the use of reference material in social work examinations, the possibility of an experiment was considered. A group of students were asked if they were for or against participating in such an experiment, and an anonymous ballot was held to ascertain their answers. Those in favour numbered 25 and there were 4 against. When this result was known, these four expressed themselves as very willing to abide by the wishes of the majority.

An intermediate examination at the end of the first year of a two-year course was chosen for the experiment. It was not a qualifying examination for entry to the second year, but was held mainly to provide students with feedback on their progress and to help in identifying any who might need special assistance. The whole examination consisted of two papers in each of which the candidates were required to write one essay in three hours, and another two papers of the traditional type in each of which the candidates were required to answer three out of 10 or 11 questions. Only the latter two papers were used in the experiment, one on Behavioural Science (sociology, psychology) and the other on Professional Studies (social work, social policy and administration, law). Because of the range of literature involved and the problem of securing equality of access to books during an examination, it was decided to restrict the reference sources to the candidates' notes on lectures and reading, together with any ' hand outs ' made available to all students by lecturers.

II.—METHOD.

The subjects were all twenty-nine students on a two-year course leading to qualification as a child care officer or probation officer. They had not attended university before their present course, but generally were educated to sixth-form level and in some cases had qualified for occupations such as teaching, nursing or engineering. Each subject was assigned randomly to one of two experimental groups. Group A contained eight men and seven women, with a mean age of 28·7 years and a range of 23-43 years. In group B there were nine men and five women, with a mean age of 29·1 years and a range of 24–44 years.

Group A took any notes they wished into an examination in Behavioural Science, while group B answered the same paper in another room in case they should be disturbed by seeing other candidates using notes. Three days later this procedure was reversed for a Professional Studies examination, in this case group B being allowed to have notes. In setting these papers, the examiners attempted to choose questions that could not be answered by reproducing notes made on their lectures. The candidates knew in which paper they could use notes about three months before the examination was held.

Five criteria were employed to assess the effects of using notes. (1) An Affect Adjective Check List (AACL) (Zuckerman, 1960) was administered to all subjects when they entered each of the two examinations, and again when they finished writing each script. This is a technique for ascertaining a subject's current emotional state. (2) At the commencement of each examination subjects were asked to answer a questionnaire about their sleep pattern on the previous night. (3) At the conclusion of the second examination, each subject was given a questionnaire asking whether or not he would prefer to take notes into future examinations, and (4) for any comments he wished to make on the experiment. (5) Finally, the examination marks were used as a criterion, and in this respect certain procedural points are important. The random assignment of subjects to groups and the invigilation of the examinations were undertaken by independent persons who were not examiners, so that the latter were unaware of the experimental condition under which particular scripts were written. Furthermore, six examiners marked certain questions independently of each other, and the anonymity of candidates was preserved by numbering their scripts. These examiners were not involved in the scoring or analysis of data on any of the other criteria.

III.—RESULTS.

Analyses of variance were performed on the AACL, sleep questionnaire and examination mark data. There are no significant differences in the ACCL or sleep questionnaire results at the commencement of the papers.

To obtain a measure of change in anxiety level while answering papers' the difference in AACL scores from the start to the end of each paper was computed for each subject. Under the with notes condition the mean *change* is –3·9 with a range of –1 to –10, and for the without notes condition the equivalent figures are –2·3 and +2 to –9. Table 1 shows this difference to be significant.

TABLE 1

ANALYSIS OF VARIANCE : CHANGES IN AACL SCORES DURING EXAMINATIONS.

Source	df	MS	F	P
Notes	1	36·48	4·33	·05
Papers	1	·27	0·03	ns
Notes × papers	1	19·63	2·32	ns
Subjects	54	8·43		

The mean and range of examination marks for each paper under each condition are given in Table 2, and Table 3 shows that while there are no significant differences either between papers or between conditions, there is a strong interactive effect involving these two factors.

TABLE 2

EXAMINATION MARKS

Paper	With notes		Without notes	
	Mean	Range	Mean	Range
Behavioural Science	47·3	36–61	53·8	33–62
Professional Studies	49·9	40–63	46·2	28–56

TABLE 3

ANALYSIS OF VARIANCE : EXAMINATION MARKS.

Source	df	MS	F	P
Notes	1	41·40	1·16	ns
Papers	1	23·60	·66	ns
Notes × papers	1	424·07	11·89	·01
Subjects	54	35·67		

Subjects preferring to use notes in future examinations number 22 compared to six who do not. This question is not answered by one subject.

A content analysis of candidates' replies to the invitation to comment on the experiment showed that eight subjects mentioned having notes as relieving tension/anxiety, four said that it increased happiness/security/confidence, and 11 considered it an aid to memory and a source of factual material. On the negative side, four subjects said that using notes was too time consuming and three considered that it inhibited original, creative thinking and tended to produce the regurgitation of notes and failure to answer the questions set.

IV.—DISCUSSION.

There is no evidence from the AACL or sleep questionnaire results that the availability of notes reduced anxiety *before* examinations. However, the significantly greater drop in AACL scores does indicate that access to notes is accompanied by anxiety reduction *during* an examination. It is possible that this reassuring experience on one occasion might serve to lower anxiety before any examinations to be held under similar conditions in future, but the investigation provides no evidence on this point. Further general support for an inverse relationship between the availability of notes and stress reactions is provided by the analysis of candidates comments on the experiment and their preference for the use of notes on future occasions. These results are very much in accordance with those of Feldhusen (1961). In the present study it would have been preferable to have used a wider range of techniques to assess anxiety, including physiological indices, but the need to minimise experimental interference with normal examination conditions made this impracticable.

Also in agreement with Feldhusen is the finding that the possession of notes does not in itself affect academic performance. It may have been helpful in the Professional Studies paper, but unhelpful in the Behavioural Science paper. Why there should be an interactive effect of this kind cannot be determined from the experiment. It is possible that despite the examiners' efforts, the Professional Studies paper did allow greater scope for the reproduction of lecture notes and factual material. In contrast, the comments of some candidates and those of the examiners are in agreement that poor results on the Behavioural Science paper were often due to the inappropriate regurgitation of notes, sometimes in reply to questions which were not set.

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INTELLECTUAL STYLE AND ACHIEVEMENT OF ARTS AND SCIENCE UNDERGRADUATES

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SUMMARY. An investigation of the quality of passes attained by 101 Arts and Science students who entered the University of New England in 1968, indicated that while convergent bias was associated, in both faculties, with more high level passes in first year, there was no difference in the relative success of convergers and divergers in second year. At the same time, it was found that among these students the relationship between choice of faculty and intellectual style was in accord with Hudson's (1966) suggestions despite the less specialised schooling of Australian students when compared with their English counterparts.

I.—INTRODUCTION.

Although Hudson's recent work (1968) has done much to expand understandings of the attitudes and interests of convergers and divergers the question of the efficacy of these intellectual styles for different academic specialities is still very much in doubt. While Hudson (1966) has demonstrated that it is the convergers among British grammar school boys who tend to specialise in science, Cropley (1967) has shown that at the senior undergraduate level the Australian young men most outstanding in science are mainly divergers. This apparent contradiction was not resolved when it was found (Cropley and Field, 1968) that the intellectual bias of Australian schoolboys specialising in science was also predominantly convergent. It would appear, then, that although the majority of science specialists entering university are convergers it is mainly the divergers among them who finally achieve the better results.

Another possible aspect of this problem was revealed in an investigation by Mackay and Cameron (1968) of convergent-divergent bias among Scottish undergraduates. While they found divergent bias strongly associated with specialisation in Arts at the first year level, there was no relationship detected between convergent bias and Science specialisation. This was partly explained by the biased nature of their sample with regard to the absence of physical science specialists, but even the Arts/divergent bias finding was only obtained when those students studying a Science subject in their Arts courses were excluded from the analysis. Though providing some measure of support for Hudson's suggestions Mackay and Cameron proposed that a clear differentiation in cognitive bias between Science and Arts can usually be expected only in an educational system, such as England's, that encourages a high degree of early specialisation.

These two issues, the apparent reversal of Hudson's converger/science specialist finding and the Arts/Science discrimination in terms of cognitive bias at university level, are the concern of the present study. It is a continuing, longitudinal investigation of the relationship between intellectual style and achievement in a sample of men students studying either Arts or Science at an Australian university. These students are now beginning the third and final year of their Pass degrees so that the data reported here concern the first and second year results only. At the same time, however, it is possible to consider intellectual bias and Arts/Science specialisation in a sample which, as was the case with Mackay and Cameron's group, has not been exposed to the degree of subject specialisation experienced by Hudson's British schoolboys: in many respects the Australian education system, and that in New South Wales in particular, is very similar to the Scottish at both secondary and university levels.

II.—METHOD.

Subjects were selected from the 1968 intake at the University of New England and the sample comprised all male students entering the faculties of Arts and Science who participated, on a voluntary basis, in an Orientation Testing Programme conducted by the Educational Research Unit. The 101 students included 52 Arts and 49 Science men and represented about 80 per cent of the total first-year male population in these two faculties. In the Arts group 39 were studying Arts subjects exclusively (Arts specialists) and 13 had course patterns that included a Science subject (Arts Intermediate). Of the Science men only two had included an Arts subject in their courses while the remaining 47 were Science specialists. All students in the sample were less than 20 years old and had been educated in Australian high schools prior to enrolment at the University.

The battery of tests completed by this group included the divergent thinking test Uses of Objects (Hudson, 1966) and two convergent thinking tests : the AL–AQ intelligence test (Australian Council for Educational Research, 1966) designed specifically for use with above-average groups, and the Co-operative Reading Comprehension Test (Higher Level C2, Form Y) (ACER, 1958).

Both the convergent tests were scored according to the published specifications while the divergent thinking test was scored for originality using the procedures described by Cropley (1966) and for flexibility using Torrance's (1962) suggestions. Subsequently, the four raw scores were transformed separately into normalised standard scores, the respective pairs summed, the summed convergent and divergent scores restandardised and the bias score obtained by subtracting the new convergent score from the new divergent score. Bias scores thus obtained for the sample ranged from $+4 \cdot 01$ to $-3 \cdot 81$ and the top and bottom 30 per cent groups classified as Divergers and Convergers, respectively, with the middle group constituting the All-Rounders. These three groups were then compared on Arts/Science choice and also, within the separate faculties, on the quality of their examination passes. For this latter purpose credits, distinctions and high distinctions awarded were grouped as ' merit ' passes and compared with the number of ordinary passes achieved in the final examinations at the end of 1968 and again at the end of 1969.

III.—RESULTS.

Table 1 shows the distribution of the 101 subjects according to choice of faculty and convergent-divergent bias or intellectual style. Associated with this distribution is a χ^2 of $8 \cdot 60$ (df 2, $P < 0 \cdot 02$) which allows a clear rejection of the null hypothesis of independence of faculty choice and intellectual style ; this is exactly the trend predictable from Hudson's findings with British schoolboys.

TABLE 1

DISTRIBUTION OF ARTS AND SCIENCE STUDENTS (N=101) ON INTELLECTUAL STYLE.

Faculty	Convergers	All-Rounders	Divergers
Arts	11	19	22
Science	19	22	8

It should be noted, however, that the contribution of the Divergers' distribution to this χ^2 is slightly stronger than that of the Convergers. The distribution of All Rounders is almost exactly what would have been predicted by chance.

When only the Arts and Science specialists are compared, as shown in Table 2, the differentiation is heightened ($\chi^2 = 17 \cdot 53$, df 2, $P < 0 \cdot 001$) and the concentration of convergers in Science is more clearly marked. Again, this is clearly in support of Hudson's findings.

TABLE 2

Distribution of Arts and Science Specialists (N=86) on Intellectual Style.

Faculty	Convergers	All-Rounders	Divergers
Arts	4	16	19
Science	22	18	7

Since the original sample was of only modest dimensions and the major aim of the study to build up a longitudinal record of their examination performances the full group was retained for this purpose. Table 3 shows the distribution of examination grades, ordinary pass and 'merit' (as defined above), obtained at the 1968 final examinations for the style groups in Science and Arts separately.

TABLE 3

Distribution of 1968 Examination Grades for Arts and Science Intellectual Style Groups.

Grade	Arts			Science		
	Conv.	A.R.	Div.	Conv.	A.R.	Div.
Merit	12	9	12	31	18	5
Pass	17	43	46	37	42	22
(N)	(11)	(19)	(22)	(19)	(22)	(8)

The distribution of merit and pass grades for the three Science style groups gave rise to a χ^2 of 7·23 (d^f 2, $P<0{\cdot}05$). The 49 Science students obtained 155 passes or better at their examinations though the Convergers among them won significantly more merits than the Divergers. The Arts results showed a similar significant trend ($\chi^2=6{\cdot}40$, df 2, $P<0{\cdot}05$) although here the success of the Convergers was mainly at the expense of the All-Rounders.

When the group commenced the second year of their studies it was found that there were 32 Science and 38 Arts students remaining. Table 4 shows the distribution of passes obtained at the end of 1969 by these students. In contrast to the first year results neither the Science nor Arts distributions showed any differences in the number of merit passes obtained by Convergers when compared with Divergers (for Science, $\chi^2=0{\cdot}59$, and for Arts, $\chi^2=1{\cdot}87$, df 2 in both cases).

TABLE 4

Distribution of 1969 Examination Grades for Arts and Science Intellectual Style Groups.

Grade	Arts			Science		
	Conv.	A.R.	Div.	Conv.	A.R.	Div.
Merit	7	7	9	10	19	5
Pass	13	26	35	21	28	9
(N)	(8)	(12)	(18)	(11)	(16)	(5)

IV.—DISCUSSION.

These results confirm Mackay and Cameron's suggestion that a greater degree of convergent bias would be found in samples containing physical science specialists. But since it is reasonable to assume that the school background of Australian undergraduates is no more specialised than their Scottish counterparts the present finding of a significant relationship between intellectual style and choice of faculty does not offer general support for their hypothesis of the reinforcing effects of specialised educational experience. The inclusion of intermediate groups did not destroy the distinction between Arts and Science although their presence did appear to weaken the trend. The similar exceptional concentration of Divergers in Arts suggests that the Science students in the Scottish sample did not provide a proper indication of the extent of convergent bias prevailing among such first-year students generally.

Despite the marked contrast in intellectual style of the Arts and Science groups their 1968 examination data show remarkedly similar trends. In both faculties those students characterised by a convergent bias appear to have excelled in the attainment of merit passes. While this finding might have been reasonably expected for Science, the fact that the convergent Arts student is so successful is rather surprising, especially in the face of the appeal of Arts studies to Divergers. It is quite likely, of course, that this is only a function of the nature of first-year university courses generally where students are introduced to large amounts of fundamental material which simply has to be mastered—an activity well suited to those with a convergent bias.

On the other hand, the 1969 (second year) results, again for both faculties, suggest that at this level the Converger's skills are not longer quite as appropriate as in first year, and that the Divergers are, in a sense, catching up. This may, indeed, be the beginning of the reversal of the intellectual bias /science specialisation relationship as suggested by Cropley (1967). In the case of Arts it may be that the divergers are not able to take full advantage of their particular intellectual skills until they have progressed beyond the initial states of their university studies. The critical data for this interpretation are still not available and these inferences must remain tentative until the end of this year. At the moment it is at least worth noting that trends clearly present at the end of first year do not pertain twelve months later. Only patience and time will show whether this pattern of change will continue.

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THE EFFECTS OF CREATIVITY AND INTELLIGENCE ON TEACHER RATINGS

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SUMMARY. The present study is concerned with the relationships between creativity and intellectual ability of student teachers and ratings of their effectiveness by pupils who differ in social class and creativity. The results indicate that teachers who score high on indices of intellectual ability and creativity or low on both of these indices are rated more favourably by their pupils than teachers who score high on only *one* of these indices. Further, teachers who score high or low on *both* indices are rated more favourably by pupils high in creativity and high in social class.

I.—INTRODUCTION.

The relationship between intellectual ability and teacher effectiveness has been extensively explored. However, research has shown that there is little or no consistent relationship between these variables (Getzels and Jackson, 1963; Morsh and Wilder, 1954). This lack of relationship may be attributable to two factors. First, the relationship between intellectual ability and favourable ratings of teachers may be subject to moderator variable effects. For example, high intellectual ability when combined with other characteristics, such as creativity, may be associated with favourable teacher ratings.

Second, characteristics of pupils may also influence the above-mentioned relationships. It would be reasonable to expect that certain kinds of pupils, e.g., pupils categorised as high in social class may prefer teachers of high intellectual ability and rate them more favourably than teachers who score low on this index. Similarly, pupils who score high on measures of creativity may react more favourably to teachers who also score high on this measure.

The present study deals with the two aforementioned issues.

II.—METHOD.

Subjects : 19 male and 26 female undergraduates ($N=45$) attending Rutgers University. The subjects were engaged in student teaching in several suburban schools in New Jersey. Each student teacher was rated by secondary school pupils in each of his classes. Thus, 1,863 secondary school pupils also served as subjects.

III.—PROCEDURE.

Student teachers were classified as high or low in intellectual ability as a result of their scores on the College Entrance Examination Board–Verbal (CEEB–V) test. Male teachers with CEEB–V scores above 540 and female teachers with scores above 520 were assigned to a high intellectual ability group ($N=22$). All others were assigned to a low ability group ($N=23$). Student teachers were also given Mednick's Remote Associate Test (RAT) (Mednick, 1962) as a measure of creativity. Male teachers with scores above 17 and female teachers with scores above 14 were assigned to a high creativity group ($N=23$). All others were assigned to a low creativity group ($N=22$).

The RAT was administered to all secondary school pupils participating in the study. Pupils in the ninth and tenth grades whose scores were 12 or above and those in the eleventh and twelfth grades whose scores were 13 or above were assigned to a high creativity group. All others were assigned to a low creativity group. These groups were approximately equal in size.

Occupation of the head of the household was used as measure of social class. Pupils whose parents held professional, semi-professional and managerial positions were assigned to a high social class group. All other pupils were assigned to a low social class group. These groups were approximately equal in size.

Each secondary school pupil rated his student teacher on a 5-point scale (1=Excellent, 5=Poor).

Three ratings were obtained for each teacher. These were; (1) the mean rating given him by all of his pupils; (2) a mean difference rating for pupils high *versus* low in social class. This rating was computed by subtracting the mean of the ratings of the high social class group from the mean of the ratings by students low in social class. Negative mean difference ratings indicated that the teacher was rated more favourably by pupils high in social class than by those pupils in the low group; (3) a mean difference rating for pupils high *versus* low in creativity. Negative mean difference ratings indicated that the teacher was rated more favourably by pupils high in creativity.

IV.—RESULTS.

Table 1 presents the means for the three different ratings for teachers who differ with respect of their scores on the CEEB–V and the RAT. Table 1 also reports the results of three 2×2 analyses of variance with non-orthogonal cell frequencies in which adjusted mean squares were obtained by a least squares solution (Winer, 1962, pp. 224-227, 291-297).

TABLE 1

MEANS OF THREE RATING SCORES FOR STUDENT TEACHERS WHO DIFFERED WITH RESPECT TO RAT AND CEEB-V.

Student Teacher Classification			Ratings		
CEEB–V	RAT	N	Mean	High *versus* Low Creativity	High *versus* Low Social Class
High	High	14	2·34	—·25	—·14
High	Low ...	8	2·71	+·11	+·19
Low......	High ...	9	2·73	+·07	+·15
Low......	Low....	14	2·44	—·10	—·11

F RATIOS FROM ANALYSIS OF VARIANCE OF RATING SCORES.

Source	Mean Rating	High *versus* Low Creativity	High *versus* Low Social Class
CEEB–V	<1·00	<1·00	<1·00
RAT	<1·00	<1·00	<1·00
CEEB–V×RAT	7·19*	4·46*	4·63*

* P<·05.

Table 1 indicates that the interaction is significant for each of the three ratings: Student teachers who are either high or low on *both* the CEEB–V and RAT are rated more favourably by all of their pupils than teachers who are high on *only one* of these variables. In addition, those teachers who were either high or low on *both* variables were rated more favourably by pupils high in creativity and high in social class than teachers who were high on only one of these variables.

V.—DISCUSSION.

The results indicating that teachers in both creativity and intelligence are rated favourably by their pupils are reasonable and tend to fit intuitive judgment.

The fact that teachers who are rated favourably in general are also rated more favourably by pupils high in creativity and high in social class suggests the possibility that in the suburban schools used in this study effective teaching involves meeting the expectation of the creative pupils and those ranked high in social class. It would be interesting to explore this notion in urban schools.

The finding that teachers *low* in both creativity and intelligence are rated favourably is difficult to interpret. Some hints for an interpretation of this finding are suggested by Wallach and Kogan's (Wallach and Kogan, 1965) investigation of elementary school children who differ in creativity and intelligence. They report that girls low in creativity and low in intelligence are very out-going and possess confidence and assurance. These children tend to compensate for low academic achievement by activities in the social sphere.

Girls high in creativity and low in intelligence are not sought as companions and tend to avoid others. Girls high in intelligence and low in creativity are sought as companions but tend to isolate themselves. These differences in social behaviours, while extrapolated from the elementary school population, might help to explain why teachers who are low in *both* creativity and intelligence tend to be rated more favourably by their pupils.

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A FOLLOW-UP STUDY OF SCHOOL ACHIEVEMENT IN RELATION TO PERSONALITY

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SUMMARY. The relationships between extraversion, neuroticism and the school achievements of a group of 128 boys at the ages of 12, 13 and 14 in a grammar school were examined using the method of 'zone analysis.' In the 11+ tests, no systematic differences between the groups were noted, but once in the secondary school, introverts obtained progressively higher marks in yearly examinations than extroverts. In introverts, low neuroticism is consistently associated with better achievement, while in extroverts high neuroticism steadily depresses academic performance over the three years to give a significant over-all effect in the third year. If the achievements of only the two high neurotic groups are considered, introverts tend to improve with age while extroverts deteriorate.

I.—INTRODUCTION.

The two personality dimensions of extraversion and neuroticism have been studied in relation to educational achievement by a number of workers, and Rushton

(1966), after a review of the literature indicating the conflicting nature of their findings, suggests that age might be an important variable in interpreting results. Warburton (personal communication, 1969) has grouped studies using Cattell's 16 PF or Eysenck's personality measures according to whether they involve primary school children, children from 11–15, adolescents from 15–18, or adults of more than 18 years of age. He regards 15 as a crucial age, and of neuroticism effects he states : " Up to the age of 15, anxiety is never an advantage, but at later ages, it is so in 24 out of 34 cases." Of introversion he states : " Before the age of 15 the introversion factors are an advantage in only 13 per cent of the cases, but after 15, the figure rises to 96 per cent."

Most of the studies which have investigated relationships between personality dimensions and academic achievement have employed correlation techniques. Eysenck (1966) has criticised such methods on two counts. Firstly, linearity of regression cannot be assumed if the Yerkes-Dodson law is held to apply to neuroticism effects ; and secondly, such methods do not allow any investigation to be made of interaction effects between the dimensions. He suggests that a more appropriate method to use is ' zone analysis.' For this, with personality variables, subjects would be placed in groups according to their scores on both the major dimensions. Furneaux (1962) has used this method of ' zone analysis' with university students, and Child (1964) with secondary school children. This latter study, however, included children of different ages and used only a very crude measure of academic achievement.

In this paper, the method of ' zone analysis ' is used to study the relationships between extraversion and neuroticism with school achievement in groups of boys in a grammar school. Their achievements are examined when they are 12, 13 and 14 and hence any changes in the pattern of relationships as the children approach the crucial age of 15 can thus be noted.

II.—DESIGN.

The boys were given the Junior Eysenck Personality Inventory at the beginning of their second year in the school. A median split was made in the distribution of scores on each of the personality scales, thus securing four groups—for both introverts and extraverts, there were groups with high and low neuroticism scores. After excluding boys who had left the schools within the three years or who had been absent from the yearly examinations held during that time, the number of boys within each of the personality groups was equalised by random selection so that a two-by-two analysis of variance design could be applied to the data. Each of the four groups comprised 32 boys.

The 11+ verbal reasoning scores of the four personality groups were first examined. From the non-significant F ratios, it was concluded that any differences in achievement which were demonstrated between the groups could not be attributed to this factor. The mean scores of the four groups in the personality scales and verbal reasoning test are given in Table 1.

TABLE 1

MEAN EXTRAVERSION, NEUROTICISM AND VERBAL REASONING SCORES OF PERSONALITY GROUPS.

Degree of neuroticism	Test	Extraverts	Introverts
Low	Extraversion	21·34	16·13
	Neuroticism	7·00	7·50
	VRQ	126·0	126·44
		N=32	N=32
High	Extraversion	21·44	16·00
	Neuroticism	14·91	16·31
	VRQ	125·22	124·50
		N=32	N=32

Two measures of school achievement were used: (i) the AQ and EQ scores obtained in the 11+ examination; (ii) the scores in four internal academic subject examinations—English, mathematics, science and a foreign language—held at the end of each of the first three years. One common paper was given to all classes and scripts were marked in most subjects by the same markers throughout. Where this was not done, the marks were scaled, using the combined 11+ quotient total as the common measure. The marks were then standardised and the total score taken as the second measure of school achievement.

The hypotheses tested were:

1. there are no differences between extravert and introvert groups in school achievement;
2. there are no differences between high and low neuroticism groups in school achievement;
3. the interaction of extraversion/introversion and neuroticism has no effect on school achievement.

III.—RESULTS.

The scores of each of the personality groups in each of the two 11+ objective tests and in the school examinations are shown in Table 2, and the F ratios of the effects in Table 3.

TABLE 2

MEAN SCORES OF PERSONALITY GROUPS.

Degree of neuroticism	EQ		AQ		1st Year Examination		2nd Year Examination		3rd Year Examination	
	Extra.	Intro.	Extra.	Intro.	Extra.	Intro.	Extra.	Intro.	Extra.	Intro.
Low ..	118·81	121·84	124·09	124·94	187·50	223·59	194·37	232·62	190·50	235·87
High ..	121·28	120·00	123·16	122·50	191·22	195·82	180·72	206·09	171·78	210·84

TABLE 3

F RATIOS OF PERSONALITY EFFECTS ON ACHIEVEMENT.

Effect	EQ	AQ	1st Year	2nd Year	3rd Year
Extraversion	<1	<1	3·213	9·702**	14·666**
Neuroticism ..	<1	1·705	1·124	3·871	3·929*
Interaction ..	2·845	<1	1·926	<1	<1

*P< ·05. ** P< ·01.

In neither of the 11+ tests are there any systematic differences in the group scores. Once in the secondary school, however, in all three years, introverts of both levels of neuroticism achieved better than their corresponding extravert groups. The size of the differences between these groups was not significant in the first year, but became increasingly significant in the second and third years. Hypothesis 1 can thus be rejected with increasing confidence.

Neuroticism effects are rather more complex. Looking at introverts and extraverts separately, low neuroticism is consistently associated with better achievement in introverts, but with extraverts high neuroticism steadily depresses academic performance over the three years to a degree which produces a significant over-all effect in the third year.

If the relative performance of the two high neurotic groups are examined over the five achievement measures, it will be seen that at the age of 11 it is the extraverted group who are marginally better than their introverted equivalents in both the selection tests. In the first year of the secondary school, the difference has now swung marginally in favour of the introverted group. In the second and third years, this tendency for the neurotic introverts to improve with age, and for the neurotic extraverts to deteriorate, steadily increases. It was not possible to test the significance of such contrary trends in the form of an interaction effect as the year groups were correlated, but the significance of the changes in secondary school performance in each of the high neurotic groups was tested separately, and the F ratios are shown in Table 4. The significant F ratios for individuals merely indicate that the scores in the three examinations were correlated. In the case of extraverts the changes over time were large enough to reach significance, and with introverts their magnitude, though well marked, fell short of significance. There seems little doubt, therefore, that the contrary direction of these changes over time are not due to chance factors.

TABLE 4

F RATIOS OF HIGH NEUROTIC GROUPS OVER THREE EXAMINATIONS.

		Between years	Amongst individuals
High neurotics	Extraverts	3·241*	9·841**
	Introverts	2·659	14·203**

* P< ·05. ** P< ·01.

IV.—DISCUSSION.

In these results, there is supportive evidence for the view that the effects of both introversion and neuroticism on the academic achievement of boys increase with age. In this sample, introversion showed a significant relationship with achievement when the boys were between 12 and 13 in the second year. The degree of confidence in the relationship was increased in the following year when they were 13/14. With neuroticism the relationship with achievement also became closer as the boys became older and reached the significance level when they were 13/14. These ages are slightly earlier than the crucial age of 15 suggested by Warburton, but it is important to bear in mind the highly selected nature of the sample. Of high ability, these boys were in a school where academic expectations were extremely high and where a boy's motivation and ability to sustain application and concentration for protracted periods is of considerable importance. It may be that these effects are not so much a consequence of chronological age itself, as of increasing pressures and expectations from the educational system. Further studies with girls, with pupils of lower ability levels, and in schools where academic expectations are less demanding, are clearly required.

The contrary effect of neuroticism, according to whether the subjects are introverts or extraverts, is of considerable interest both theoretically and methodologically. From a theoretical point of view, some explanation is required why high neuroticism should have contrary effects on extraverts and introverts. Methodologically, this finding amply justifies Eysenck's view that correlational methods have serious limitations when applied to personality data and that interactional effects between the dimensions themselves warrant a place in research designs.

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INTELLECTUAL ABILITIES OF IMMIGRANT CHILDREN

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SUMMARY. Test scores on the WISC and Schonell GWRT of 61 children of West Indian parents attending a child guidance clinic have been compared with results of a similar number of English controls. The scores were also compared of those West Indians who had arrived in the UK before and after the age of 5 years. Significant differences were found on vocabulary and on four of the five 'performance' subtests, and the early arrivals tended to do better than later arrivals on the subtests which had been done relatively badly by all immigrant children. It is concluded: (*a*) that teaching with constructional and geometrical material is at least as important for immigrant children as is language teaching; and (*b*) that intelligence testing of these children can lead to serious misclassification unless cultural factors are taken into account.

I.—Introduction.

The subject of cultural influences on cognitive development has recently been reviewed in detail by Vernon (1969). Summarising his own findings on a group of Jamaican boys he states (p. 227) that they " were noticeably more successful on standard classroom tests of English and arithmetic than on oral comprehension of language . . . Much more striking is their deficiency on non-verbal materials such as Matrices, Kohs' Blocks and Formboard, though relatively high on perceptual and drawing tests." Among the factors contributing to these deficits Vernon includes the colloquial ' pidgin ' English, the formal and repressive discipline of local schools, and the often unstable and yet conformist and authoritarian nature of family life. He concludes (p. 231) that to remedy the handicaps arising from the primitive, non-technological environment, " the greatest promise of quick advance lies in the field of language-teaching . . . as a medium for advanced education, communication and thinking."

Earlier reports in this field are also chiefly concerned with language education. In Goldman and Taylor's (1966) review, the discussion of problems in determining ability levels involves, apart from a summary of Vernon's findings, only results of IQ or language tests. The ILEA report (1967) on education of immigrant pupils devotes an entire section to the language problem, but does not consider education in non-language abilities in any detail.

In Graham and Meadows' (1967) account of 55 children of West Indian parents, referred to a child guidance clinic over a period of three years, intelligence test scores were not discussed in detail; but, apart from significantly lower IQs of the girls in the study, no significant differences in intelligence or in reading ability were found between the West Indian children and matched English controls. In the illustrative case histories, however, both the children who were tested on the WISC achieved lower Performance than Verbal IQs. In this connection, it is noteworthy that Vernon also presents the results on his test battery of English subjects from a school for maladjusted children. In general, these children did poorly on scholastic (arithmetic, spelling) tests and on abstraction tests, while their performance on non-verbal tests (mazes, blocks, formboard) differed little from the reference group of English boys. Rutter *et al.* (1967) have also found that psychiatrically disturbed children tend to have low scores on reading tests.

II.—Sample and results.

The 61 subjects in this study were all the children of West Indian parentage who had been referred to a London Child Guidance Clinic from 1965 to 1968, inclusive, and who had completed the WISC tests. The reasons for referral covered the range usual to these clinics and included scholastic difficulties. Ages ranged from 5 to 15 years. Every West Indian child except ten was matched with an English counterpart of the same sex whose age at testing was no more than three months apart. For the ten subjects for whom no closer match could be found the difference was between three and six months. In addition to completing the WISC, every child had been given the Schonell GWRT. The raw scores on the WISC were converted to scaled scores using the Scottish Standardisation tables.

TABLE 1

Mean Scores of West Indian and English Groups and of West Indian Subgroups.

WISC subtests	West Indians	English Controls	Age at arrival in UK	
			below 5 years	above 5 years
Information	7·2	8·2	7·4	7·0
Comprehension	9·5	10·2	10·6	8·5†
Arithmetic	6·6	7·5	6·7	6·3
Similarities	7·4	8·4*	7·5	7·2
Vocabulary	8·9	10·3‡	9·7	8·0†
Verbal IQ	87	95	91	85
Picture Completion	9·2	10·3	9·2	9·1
Picture Arrangement	7·8	9·4§	8·2	6·8
Block Designs	8·0	10·3§	8·6	7·4
Object Assembly	9·3	11·5§	10·6	7·2§
Coding	8·0	9·4‡	8·7	7·0
Performance IQ	90	102	94	84
Full Scale IQ	87	98	91	83
Reading Quotient	77	82		

Levels of significance of differences between groups:
*P < ·05; †P < ·02; ‡ P < ·01; § P < ·001.

Table 1 shows the mean test scores of (*a*) the entire West Indian group and their English counterparts, and (*b*) those West Indian children who were born in the UK or had arrived before the age of 5 years, and those who had arrived in the UK after the age of 5. It will be seen that the scores of both subjects and controls, considered as profiles, run to some extent in parallel, both groups having slightly lower verbal than performance scores (notably on arithmetic) and both having low reading quotients. The greatest differences between the groups are, however, on their performance scores: except for Picture Completion, all these differences are highly significant, while among the verbal tests only vocabulary scores differ significantly. (In view of the number of *t* tests done, $P < \cdot 05$ can be regarded as only suggestive of significance.)

In the comparison between the subgroups of West Indian children, it will be seen that those who arrived earlier in the UK achieve significantly higher scores than those who arrived later on Comprehension, Vocabulary and Object Assembly: indeed, their scores are similar to those of the English counterpart group. The 'early arrivers' also achieve suggestively higher scores on Picture Arrangement and Coding; but not, contrary to expectation, on Block Designs.

III.—DISCUSSION.

The results of both the West Indian children and the English controls, particularly with their lower arithmetic and reading scores, resemble those reported for maladjusted children by Rutter *et al.*, and by Vernon, noted in the Introduction. It appears, therefore, that the association between maladjustment and general pattern of test scores is similar for both West Indian and English children, and that differences between mean scores of the groups (associated generally with differences greater than one scaled-score point) may be attributed to other influences than maladjustment. In fact, the subtests on which significant differences between the groups are found include those which would be expected on the basis of Vernon's findings for children in Jamaica (Vocabulary, Block Designs, Object Assembly) and for which the differences may be attributed to cultural factors, as may the differences on Picture Arrangement and on Coding (the unfamiliar nature of the material in the first and the stress on speed in the second).

The influence of cultural factors may be further examined in the comparison between the scores of those West Indian children who were in this country before the age of 5 (i.e., had all their schooling here) and those who came later (a part at least of whose schooling had been in the West Indies). On four of the subtests (Information, Arithmetic, Similarities and Picture Completion) differences between the West Indian and English groups and between the two West Indian subgroups were not significant or only suggestively so, suggesting that these abilities are acquired to a very similar extent in either culture. On Vocabulary, however, the significant differences between both groups and subgroups, and the difference on Comprehension between the West Indian subgroups, support Vernon's observations on the retarding effect of the local dialect and of 'old-fashioned' schooling.

Apart from Picture Completion, it is the performance subtests which show the greatest differences, between both groups and subgroups. Between the West Indian and the English children the differences on all the remaining performance subtests are highly significant: between the West Indian children who arrived in the UK before and after the age of 5, mean differences on these subtests range from 1·2 points on Block Designs (not significant) to 3·4 on Object Assembly (highly significant). This discrepancy appears paradoxical, in view of the high loading of both these subtests on a spatial factor (Wechsler, 1958), and will be discussed elsewhere: the general pattern of results is consistent with the view that performance abilities are at least as culturally determined as are verbal abilities, and that change in cultural environment results in a change in these abilities.

This study suggests two main conclusions: the first is that, when compared with English children, the group of immigrants studied were at a greater disadvantage on performance problems than they were on verbal problems. Immigrants from other countries may have great language problems, but it is likely that they too will have at least as great difficulties with performance material. It is difficult to agree with the view that the highest priority in education of these children is in the field of language teaching: at least as high priority should be given to teaching with mechanical and constructional objects. Experience with African pupils even in their late teens (McFie, 1961) suggests that considerable improvement can follow the teaching of accurate manipulation of spatial material.

The second, and more immediately practical, conclusion is that straightforward calculation of IQs from the test results of immigrant children is open to question.

The mean Full Scale IQ of those children who came to this country after the age of 5 was 15 points, and Performance IQ 18 points, below that of English controls. In the absence of norms derived from their countries of origin, test scores may give an incomplete indication of ability, since cultural factors are clearly operating.

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(*Manuscript received* 19*th March*, 1970)

SUMMARIES OF RESEARCHES REPORTED IN DEGREE THESES

THE EFFECT OF THE FIRST YEAR OF TEACHING ON TEACHERS' ATTITUDES TO THE PROFESSIONAL ELEMENT IN THEIR INITIAL TRAINING COURSE

By D. C. WEAVER

(*Abstract of thesis submitted for the degree of M.Ed., University of Manchester,* 1969)

Aim : To develop attitude scales with which to measure any change in the attitude of teachers to the professional element in their initial training course, occurring during the first year of teaching.

Procedure : Four colleges of education were chosen from one ATO to give a full range of male and female students, both young and mature, who had undergone a training course to teach children in the infant/junior, junior/secondary or secondary age-ranges. Thurstone-type attitude scales were constructed to measure the teachers' attitudes to Psychology of Education, Philosophy of Education, History of Education, Curriculum Studies and Teaching Practice and scored using a Likert method of five-point acceptance or rejection of the statements. The scales were administered to 213 students as they finished their training course in July, 1966, and to the same students again in July, 1967, after they had taught in schools for one year.

Results : (1) The attitudes to the professional element in the initial training course which the students hold then they leave college do change significantly in a negative direction after one year in schools.

(2) The attitudes to the different subjects of the Education course are significantly different from each other but the change is not consistent for all subjects.

(3) There was a clear preference order for the subjects of the Education course and this order was broadly maintained by the four colleges after the second administration of the scales. This order was : Psychology of Education, Teaching Practice, Philosophy of Education, History of Education and Curriculum Studies, with Psychology of Education rated as the most useful element.

(4) The attitude to Psychology of Education was particularly favourable, and the attitude change, although in a negative direction, was extremely small.

(5) The female students have, on average, a better attitude to the professional element of the course than the male students, but after one year the female attitude showed a faster rate of deterioration than did the male attitude.

(6) The students in the all-female mature-students' college returned scores which were significantly higher than the scores returned by the students in the other three colleges, on both administrations of the scales.

(*Manuscript received 16th February,* 1970)

THE STABILITY OF TEACHER BEHAVIOUR IN CONDITIONS OF VARYING CLASS SIZE

By K. A. OAKLEY

(*Abstract of thesis submitted for the degree of M.Ed., University of Manchester*, 1969)

Aim: To investigate the possibility of variations occurring in observable teacher behaviour when teachers are faced with classes of widely varying sizes. This required the development of a method of work sampling for teacher behaviour in the classroom situation.

Method: Six teachers were observed working with a group of 120 children, aged 9 to 11, in a primary school. These 120 children worked in a form of ' team teaching ' situation where the class size varied, according to the planning of the teacher team from less than 10 to over 100.

The work sampling technique obtained information on the following items of the teacher's classroom behaviour and certain pupil activities reflecting the teacher's style:

(*a*) Teacher verbal behaviour, using the seven items of direct and indirect influence of the system of interaction analysis.

(*b*) The content of this verbal behaviour: referring to skills, traits or moral values, controlling or managing.

(*c*) The type of teacher-child contact: four categories of direct contact, e.g., questioning; eight categories of indirect contact, e.g., using television; three categories of non-contact, e.g., conference with other adult.

(*d*) The size of group the teacher was in contact with: individual, less than 7, 7 to 50 per cent of class, more than 50 per cent of class.

(*e*) The size of working group established by the teacher, categorised as for item (*d*).

(*f*) Pupil classroom activities in 22 categories, e.g., listening or looking, writing of a ' free ' creative or personal type.

(*g*) The amount and size of social groups established by the children themselves; pairs, groupings based on the table or other furniture unit, larger social interacting groups.

The results were subjected to Friedman two-way analysis of variance.

Results: Varying the number of children in the class does not lead to dramatic changes in the teacher's classroom behaviour.

A. Changes in class size do not appear to affect:
   (1) The teacher's basic verbal behaviour pattern.
   (2) The amount of effort needed to control and discipline classes. (Methods may alter but the total amount is unaltered.)
   (3) The amount and variety of pupil activities.
   (4) The amount and type of pupil-to-pupil interaction.

B. Where class size does appear to exert some effect the following general conclusions can be made:
   (1) Classes of less than 10 or more than 100 are more likely to contain variations than the range of class sizes 20 to 80.
   (2) The behaviour in the traditional class size for this school (40) is found to differ somewhat from the activity patterns found throughout the rest of the 20 to 80 size range.

These conclusions are seen operating on:
   (1) The methods of direct contact between teacher and class.
   (2) The amount of individual attention received by the children.
   (3) The amount of individual and small group work.

C. Changing the subject area can cause variations in the classroom behaviour as great as those due to changes in class size.

D. Teacher inclination, the teacher's own style, is by far the most important determinant of what occurs in the classroom.

(*Manuscript received 25th February*, 1970)

TESTS OF DEVELOPMENT IN CHILDREN'S UNDERSTANDING OF THE LAWS OF NATURAL NUMBERS

BY P. G. BROWN

(*Abstract of thesis submitted for the degree of M.Ed., University of Manchester,* 1969)

AIM: To construct a battery of written tests to be validated by oral tests in order to study the course of development of understanding of the laws of natural numbers in primary school children.

SAMPLE: 180 children aged from 6 to 11 years formed the sample, 36 from each of the top infant and four junior year groups of an infant and junior school. Two groups of 40, each with 8 children randomly selected from each of the five year groups, formed respectively an experimental and a control group.

MEASURES AND PROCEDURE: (*a*) A written group test with parallel forms was devised, consisting of 65 items in seven sections, respectively concerned with the identity, commutative and associative laws for addition and multiplication and with the distributive law.

(*b*) A battery of 19 Piaget-type tests with concrete mathematical situations and using mainly structural materials was devised to parallel the written test. It included Piaget's tests for conservation, spontaneous correspondence, additive composition and tests for the law of closure. Both measures contained closely related non-examples of the laws.

The written group test was given to the sample of 180 children in the Autumn term. After the battery of Piaget-type tests had been given individually to the experimental group, comparisons were made between the performances in the written and Piaget-type tests and between the performances of the experimental and control groups in a written re-test.

RESULTS: (1) A progressive gain in understanding with increased age was indicated, but in each year group there were exceptional children whose performance was advanced or retarded by up to four years compared with their peers.

(2) Many children who appeared to understand certain laws of number failed to appreciate closely related non-examples of the laws, the latter being a valuable criterion from which to confirm fuller understanding.

(3) At about the age of 7 years the understanding of closure preceded the understanding of identity. Next came commutativity and associativity between the ages of 8 and 10 years, with addition usually preceding multiplication; but this order could be reversed depending on the type of test. Distributivity was apprehended by few children before the age of 10 years. It should be recognised that generalisations about the laws had not necessarily been made.

(4) With the concrete mathematical situations many children showed greater and earlier understanding than with the written form which appeared to be a more rigorous testing device.

(5) There was no consistent evidence that the group of children who took the Piaget-type tests made a greater improvement than those who had not taken them.

(6) The qualitative analysis revealed that most of the elementary co-ordinations with regard to the laws of natural numbers appeared to be more difficult than Piaget's conservation of number. The oral responses suggested three main stages of development: (i) global assessments; (ii) semi-operational; (iii) operational. Children could be at the pre-operational stage for some tests and the operational stage for others.

(*Manuscript received 25th February,* 1970)

SCIENTIFIC THINKING IN BIOLOGY BY PUPILS WHO HAVE COMPLETED GCE O LEVEL COURSES IN BIOLOGY

BY L. D. JOHNS

(Abstract of a thesis submitted for the degree of M.Ed., University of Manchester, 1969)

AIM : To investigate the factor structure of a number of measures of convergent and of divergent thinking, and to examine the relationship between the factors obtained and (*a*) achievement in biology, (*b*) scientific thinking in biology.

MEASURING INSTRUMENTS : The four measures of convergent thinking were AH5 Parts I (verbal) and II (spatial) and the Differential Aptitude Tests of Verbal Reasoning (Form A) and Space Relations (Form A)by Bennett, Seashore and Wesman, i.e., two verbal and two non-verbal measures. The measures of divergent thinking were three tasks devised by Torrance and his associates : Figure Completion, Circles, Uses of Tin Cans, and a fourth task by Getzels and Jackson, Word Association. Achievement in biology was measured by O-level grades in the GCE examination of the Joint Matriculation Board. Scientific thinking was measured by a ' Use of Scientific Method ' test specially constructed for the investigation after a try-out in two mixed grammar schools. The items were designed to assess a variety of abilities recognised as constituting aspects of scientific thinking in biology.

SAMPLE : The experimental sample consisted of groups of boys and girls from five grammar schools totalling 143 subjects. All subjects had just taken the O-level biology examination in 1968.

METHOD : Correlations for the separate schools were calculated and a best estimate of the overall correlations between variables was obtained. A factorial analysis by the method of Principal Components was carried out and the significant factors obtained were rotated to obtain a Varimax solution. Following the factorial analysis four analyses of variance were made. Two analyses were used to compare convergent and divergent thinkers (as indicated by the verbal measures) in respect of achievement in biology and of performance in the ' Use of Scientific Method ' test. In the remaining analyses of variance similar comparisons were made for convergent and divergent thinkers as indicated by the non-verbal measures.

RESULTS : Four factors were obtained from the factorial analysis. Factor I seemed to represent scientific achievement ; Factor II, divergent non-verbal thinking ; Factor III, divergent verbal thinking, and Factor IV, convergent thinking. These results indicated a high degree of separation between divergent and convergent measures, and also between divergent verbal and non-verbal measures. The analyses of variance carried out on results from the ' Use of Scientific Method ' test indicated, beyond the 5 per cent level of significance, that convergent thinkers, as indicated by both verbal and non-verbal measures, were superior to divergent thinkers. In achievement in biology convergent thinkers, as indicated by the non-verbal measures only, were superior (at the 5 per cent. of significance) to divergent thinkers. It would seem, from the results of this study, that convergent thinking is the dominant mode of thought associated with scientific thinking as measured in this investigation.

(Manuscript received 26th February, 1970)

BOOK REVIEWS

BULL, N. J. (1969). *Moral Education*. London: Routledge and Kegan Paul, pp. 183, 25s.

BULL, N. J. (1969). *Moral Judgment from Childhood to Adolescence*. London: Routledge and Kegan Paul, pp. 303, 50s.

Dr. Bull takes as his base-line Piaget's early research into moral development which goes back some forty-five years. It may be useful, therefore, by way of introduction, to consider briefly the context of the 'patron's' pioneer studies in the 1920's. The texture of the work carried out in the Institut J-J Rousseau in Geneva, where Piaget was director of research, combined the strong warp threads provided by the Institut and the interlacing weft of the international concerns centred on the other side of the lake.

In the Institut, now the Institut des Sciences de l'Education, were combined the deep concern of the Director, Pierre Bovet, for moral education and the equally profound interest of Edouard Claparède, its founder, in discovering how children's knowledge grows. When the young director of research started his investigations in the middle 1920's he was encouraged to tackle a research problem in the field of moral ideas and to treat it as a contribution to epistemology. In this context, a great deal of the criticism aimed at Piaget, including some in these books, is wide of the mark, for he did not set out to be an educational psychologist; his interest then, and now, is that of an epistemologist, who tries to discover how knowledge grows. This explains, even if *pace* Dr. Bull it does not excuse, Piaget's concentration on cognitive rather than orectic aspects of development.

In the wider field of international concerns at Geneva fifty years ago, there was a deep interest in the causes of the moral failure that led to World War I, and hence in seeking to promote co-operation, both between nations and between social classes. A small number of 'the great and the good' appeared, in turn, at international congresses on 'self-government' for school children, in the Boy Scout movement, in the contribution of the Dalton plan and group-project work to co-operativeness, and everybody spoke with '*la chaleur d'apotre*.'

It may also be said in passing that psychological investigators fifty years ago were necessarily a great deal less 'sophisticated' than their successors nowadays and, moreover, they worked within very restricting limits. Piaget is scolded by Dr. Bull for not carrying forward his research into the adolescent years when, in fact, he was limited to working in a poor, working-class school, where the school-leaving age was low, because none of the grand secondary schools welcomed visits from psychologists. For these and other reasons, therefore, it is as well to remind ourselves modestly, when we repeat the experiments of pioneers of 45 years ago, that our wider view, greater knowledge and general superiority of outlook may possibly be due to our good fortune in standing on the shoulders of our predecessors and in being privileged to work in more enlightened times.

Dr. Bull's book on *Moral Education* is based on the developmental account of moral judgments that emerged after three years of research with 360 boys and girls, 30 of each sex for every other year from 7 to 17 years of age. The main body of this research, which is exhaustively reported in *Moral Judgment from Childhood to Adolescence* consisted mainly of individual interviews at which specially-drawn pictures, representing murder, physical cruelty, stealing and lying were used as projective tests. In addition, six written tests were administered to groups. The account of the development of moral judgments is supported by a statistical analysis of correlations with sex, intelligence, socio-economic background and religious influences. The author's research confirms the view that the most striking aspect of moral development during the years he has studied is the emergence of autonomy. "The climacteric development comes between 11 and 13 years, with girls clearly in advance of boys."

Dr. Bull's researches lead him to affirm that, " . . . the female is inherently more truly moral than the male." It may be suggested that a closer analysis of sex-differences might have led to a less sweeping generalization (e.g., W. A. Lloyd, Les idées morales chez les enfants, *Paedagogica Europaea*, 1966, pp. 66-87). In an analysis of the moral judgments of some 5,000 boys and girls it has been shown that the most striking sex difference is between the willingness of girls to admit responsibility only for socially-approved activities and the willingness of boys to admit responsibility for all actions, whether approved or not. It seems to be the case that girls are much less ready than boys to admit responsibility for actions, whether socially approved or disapproved, and a cynical research student has suggested that the most one can say is that " the female is more sophisticated than the male."

While welcoming these two volumes as evidence of a renewed interest in the analysis of moral development, one reader has been tempted to pass a moral judgment about the rightness of publishing as two volumes books with so much overlap. Librarians anxious to make the most of their library grants will be in a quandary, so it may be useful to add that those catering for psycho-metrically inclined readers might find *Moral Judgment from Childhood to Adolescence* the better investment, while those willing to take the experimental evidence on trust, will find his research findings incorporated in the author's wider consideration of *Moral Education.*

W. ARNOLD LLOYD.

BUROS, O. K. (Ed.) (1970). *Personality Tests and Reviews.* Highland Park, N.J., The Gryphon Press, pp. 1690, $35.00.

For the 30 years up to 1970, The Mental Measurement Year Books have been the standard compendia for test information for psychologists in the English-speaking world, but such has been the efflorescence of new tests that this new monograph has been compiled to extract from previous M.M.Y.s relevant existing test reviews and references together with new material, a comprehensive bibliography of 513 personality tests ; 7,116 new references dealing with the construction, use and validity of specific tests ; separate author indexes for all tests having 25 or more references ; and a scanning index to all personality tests in the volume. The kind of problem that the editor and his staff have been faced with due to the literature explosion is well exemplified by Buros' statement that " the number of new personality test references in this volume alone is greater than the total number of personality test references in the first five M.M.Y.s and very nearly as great as the number of references for all tests both personality and non-personality, in the 6th M.M.Y." In the face of such a task the American readiness to create non-words might be excused, although a patient might well take umbrage at being tested for ' non-personality.'

For the practising psychologist, this volume, with its complementary 7th M.M.Y., due in 1971, will have the greatest value in at least two respects. First, detailed test information, thoroughly updated, is made readily available together with the research literature pertaining to the test. Second, and of perhaps the great importance, perusal of the reviews is an educational experience of great richness. The contributors are chosen with eclecticism and are broadly representative of psychologists of standing on both sides of the Atlantic. Occasionally, however, the differing theoretical standpoints and emphases of the reviewers can, at its most marked, lead one to query whether they are discussing the same test, and at its least be gently amusing. It is impossible, nevertheless, to read them without gaining an improved grasp of the principles of test construction, administration and interpretation. Student and professional alike will benefit from the condensed clarity of these reviews This reviewer found it a slight disappointment to note that only the Bannister-Fransella Grid Test for Schizophrenic Thought Disorder represents the use of Role Construct Repertory Grid techniques and that Osgood's Semantic Differential rates only a reference to " The Measurement of Meaning." Perhaps the very flexibility of these techniques is what prevents them being treated as other ' tests ' are in this volume.

There are books, the Bible for example, which are frequently possessed but seldom consulted. 'Buros,' as reviewed here and in the former form of the M.M.Y.s is the sort of book which, by contrast, is frequently consulted but seldom possessed. For a volume of such weight (at 35.00 dollars, it works out at 32 cents an oz.) the reviews make commendably light reading and are remarkable for the lucidity and evenness of the writing considering the multitude of reviewers and the multiplicity of tests and techniques reviewed. D. F. CLARK.

CATTELL, R. B., and WARBURTON, F. W. (1967). *Objective Personality and Motivation Tests.* Chicago: University of Illinois Press, pp. 687, n.p.

This book consists of two separate parts—a theoretical introduction to objective personality testing in which some of the major findings are outlined and, the main body of the book, a list of the personality variables derived from objective tests, their rationale and evidence for their validity.

The first section brings home to the reader with great force (if he can unravel the complexity of Cattell's style) many of the objections to the use of objective personality tests in their present form. Despite the ingenuity of their construction, the hard evidence for their validity is simply lacking. Sweeney's contribution on the measurement of motivation and the strength of dynamic structure factors is a clear illustration of this problem. The emergence of ego and super ego factors and ergs and sentiments makes good psychological sense, but in all honesty the question must be raised as to whether these factors could be thus identified from the test loadings alone by objective factor-analysts ignorant of the background of work at Illinois.

The second section listing the enormous number of objective test devices (2,364 variables from 688 tests) cannot of course be read through consecutively other than by lovers of Bradshaws, Wisdens and telephone directories. Nevertheless, it contains all the essential information for the research worker who needs to use these tests. The age-range for each test is given as is the time for administration. The variables derived from each test are listed together with any loadings on factor-analyses. It is noticeable that many of these variables are as yet untried in that no factor loadings are cited. Then the theory and rationale of the test are explained and it is interesting to see to what extent Cattell has been influenced by Freud and McDougall. For example, the theory of test T40 is " that the more highly repressed a person is the more his needs will be those of aggression and that consequently he will enjoy aggressive humour more." Sometimes, however, the theory is clearly Cattellian and is hard to follow on account of the neologistic style. Thus the theory of T54, for example, is in part related to the fact that . . . " departure from cultural values will be largely a function of U.I.20 (abcultion) and also of Surelia, U.I.28, and especially the self-isolating inner life of U.I.25—Tense Inflexidia . . . " Finally, after the statement of the theory, test extracts are given, and the method of scoring explained.

For whom is this book intended? The reviewer has used it with final year undergraduates in psychology but these found it hard going and preferred some of Cattell's less complex books. However, for the research worker in the field of personality testing (rather than, perhaps, personality), this book should be a *vade mecum.* The continued use of pencil and paper personality inventories can really only be justified on the grounds of their simplicity, their face validity and the lack of anything else. Here, however, a monument to the prodigious industry of Cattell and his associates, lies the alternative as yet untried but pregnant with possibility. These tests need verification, and the publication of this compendium now makes this possible.

In summary, therefore, this book lies between the Horatian poles. It is not, and was not intended to be, a monument more lasting than brass. On the other hand, it is not a ridiculous mouse. Rather it is an impressive base from which future researchers can advance and it is indeed a fitting tribute to the life and work of the late Professor Warburton. PAUL KLINE.

EYSENCK, H., EYSENCK, S., *et al* (1969). *Personality Structure and Measurement.* London: Routledge and Kegan Paul, pp. 365, 63s.

This new study by the Eysencks is without question a most important book in the field of personality assessment and must be carefully read by any one concerned with this area of psychology.

The first part of the book contains much that is familiar to students of the psychometrics of personality. It reviews modern factor-analytic studies, places them in their historical perspective (the book is dedicated to Spearman) and examines in detail the construction and validation of the M.P.I., forerunner of the E.P.I., the present basis of Eysenck's personality dimensions, neuroticism and extraversion. So far an excellent review of the literature.

The real nub of the book, however, is now presented—consisting of a joint study of the Eysenck, Cattell and Guilford Personality Tests. All these scales were administered to a large sample of students. Although these scales were factored the most important part of the study consisted of a rotated factor analysis of the inter-item correlations of all these tests. Very briefly the resulting factors supported the Eysenckian claim that two dimensions best describe the personality sphere since neither the Guilford nor the Cattell first order factors emerge clear cut from the analysis. Considerable doubt therefore, must be cast on all those theses and papers in which Cattell factors are patiently correlated with academic measures—factors " whose existence secures no support from this investigation " (p. 228).

The last section of the book is concerned with the personality factors of children based mainly on the administration of the J.E.P.I., which appears to be a satisfactory instrument.

Many psychometrists (e.g., Semeonoff, in his 1969 address to the British Association) have considered that both Eysenck's and Cattell's different solutions to the assessment of personality could be simultaneously both correct and that in practice very often the multi-factorial approach was the more sensitive. Now this book by Eysenck appears to sweep the ground from under their feet. The Cattell items do not load on 16 recognisable first-order factors. The only stability in the test appears to be the second-order factors of neuroticism and extraversion. The obvious question, therefore, concerns the technical excellence of this study. The appendix on the method used to relate factors derived from different individuals in different studies is too compressed for any readers other than expert mathematicians. For example (p. 338) we find the phrase . . . " after a good deal of algebra it is seen that . . ." This inevitably means, in many cases, that it will not be seen. However, it is to be noted that Eysenck's two scales were represented by 114 items whereas Cattell's 16 were represented by only 99 items in the analysis—a weighting somewhat biased to the production of two factors. Factor analyses are not, alas, independent of their samples. In view of the considerable empirical support for the Cattell factors to be found throughout his voluminous writings, it would be unwise to jettison the scales as a result of this one study when the numbers of items used were so disparate. What must now be eagerly awaited is the riposte from Illinois. In summary, an essential book for the student of personality assessment and a fearful warning against the blind acceptance of scales on the basis of their nomenclature.

PAUL KLINE.

LEWIS, M. M. (1968). *Language and Personality in Deaf Children.* Slough: National Foundation for Educational Research in England and Wales, pp. ix+239, 50s.

This book is an account of an original and ingenious piece of research based on the idea that the frequently reported immaturity of deaf children in orectic development (defined as personal, social, emotional and ethical development) may be due in part to inferiority in language, and hence (it is argued) in concepts for these areas, with resulting handicap to orectic development. The basic idea is that without linguistic symbols the ability to perceive, remember, think about and act upon experience is stunted. For example, Lewis suggests that the educationally deafer child who lacks two words 'father' and 'husband' in which the same person is involved " tends to lack the means of discriminating between the two functions and, one would infer, is less able to entertain the two distinct functions in his thought, feeling and general behaviour in connection with this person " (p. 126).

The first four chapters are about the nature of language and the general linguistic development of deaf children, with an interesting review of the research relating cognitive deficiency to language handicap (the minority dissenting view also being represented, e.g., by Hans Furth). Surprisingly, Whorf is not mentioned in support of the view that language has a direct effect on thinking and behaviour. The second part of the book (chapters 5-11) is concerned with the investigation itself and its implications for the education of deaf children. An appendix includes the material used: two Family Relations tests, each consisting of line drawings of a family, followed by sentences to be completed according to understanding of relationships, some of which can be judged from the drawings, and others from additional information, e.g., " Mrs. White has a sister, Mrs. Small. Mrs. Small is Anne's ————. ' Two picture tests are also given, both taken from the Pickford Projective Pictures, with brief stories added, e.g., " The little girl has lost her way. The policeman is taking the girl home." The task this time is to choose appropriate adjectives from a list of fifty, increasing in difficulty, to complete the sentence. " The Man in the picture is ————." The scores for these orectic vocabulary tests are compared with the scores on two Antonyms tests.

As the crux of the matter is whether relative inferiority in the orectic vocabulary (which was confirmed) correlates with inferiority in orectic aspects of personality, the criterion for the latter is very important. Professor Lewis uses teachers' ratings on twenty-one traits, arranged in four trait-groups, Personal, Emotional, Social, Ethical. Positive results were obtained for trait-groups I (Personal) and IV (Ethical), but not for II and III (Emotional and Social). The criterion can be criticized on several grounds. Since the ' orectic ' language tests were concerned mainly with family relationships, the logical comparison would have been with behaviour and experience at home. The reason for not making this comparison seems rather weak: " ratings obtained from parents—often, if not always, emotionally involved—are likely to be of doubtful validity." However, information obtained from parents need not be in the form of ratings, although it could lead to rating by the experimenters. It is implied that the rating by the teachers was an observational method, but this is not exactly true, except perhaps retrospectively. Several of the traits, specially in groups I and IV have a cognitive bias, e.g., " views of right and wrong " (which would raise the correlation with the ' orectic vocabulary ' score) or they call for an overall expression of opinion, e.g., " more advanced in personal development than most children of the same age in your experience." Other traits such as ' easily distracted,' ' diligent ' would seem to be more closely tied to observable behaviour, but why not base the ratings on sessions of immediate observation, which might also include role-playing both with and without the use of language? (Lewis himself refers to the research by Heider and Heider on role-playing in deaf children). One of the difficulties is that orectic development includes the capacity for emotional relationships which perhaps cannot be judged by an outsider from behaviour alone. In other words, far from being experimentally undesirable, it may be necessary to get the point of view of those who are emotionally involved, i.e., the children and their relatives. Until the difficult problem has been solved of a more adequate research criterion of orectic development, Professor Lewis's thesis that orectic development depends on concepts, and concepts depend on language, remains unproven. The frequent finding that deaf children of deaf parents tend to have better emotional adjustment than deaf children of hearing parents, and the occasional report that partially deaf children have more social problems than the severely deaf, would seem to argue against it.

Professor Lewis has useful things to contribute to the education of deaf children, including a reminder that there needs to be greater emphasis on the receptive side, avoiding the danger of spending so much time getting the deaf child to speak that we forget to speak to him. However, the interest of the subject matter lies not so much within the special field of deafness as in keeping alive basic and tantalising problems of the relation of language to thinking, feeling, and behaviour.

RUTH BOWYER and PATRICK O'DONNELL.

MACY, C. (Ed.) (1969). *Let's Teach Them Right.* London : Pemberton Books, pp. 214, 35s.

This is a very useful book of readings which " considers the pros and cons and the substance of religious and moral education." The eighteen contributions are from very diverse sources and yet gain from being presented together. The three major foci of concern are the logic of religious education, the present state of religious and moral education, and concrete proposals about the kind of syllabus which would produce people who could reasonably be described as morally educated. Certain themes run through the book. These include :

(1) The realisation that the situation brought about by the 1944 Act is in many ways unsatisfactory.
(2) The recognition that the relationship between the content and manner of religious education and its effects is simply not understood.
(3) The idea that moral education should be regarded as a general orientation in education rather than a specific content area, with all the implications of that change of emphasis.

Individual contributions which deserve special mention are Lionel Elvin's dignified denial of the right of Christians to monopolise the content of religious education, and the papers of Harold Loukes and M. G. Hinton. Loukes and Hinton point out that to change the verbal labels on courses to read ' moral ' instead of ' religious ' does not constitute progress. Loukes writes : " In the current argument about the claims of moral education to replace religious education there is the curious assumption that we know what religious education is, and do not like it, and that we know what moral education is and do like it." Hinton very reasonably suggests that the assumptions on which all school subjects are based should be explored, and that this will lead to consideration of " questions which religions try to answer." He continues : " It is very common for sixth formers . . . to strain at gnats of dogmatism in religious education periods, but to swallow camels of philosophical presuppositions if the period is called science, or economics, or art."

It is particularly refreshing to find a contribution on sex education (by Alan Harris) in this book. Sexual morality is of central concern to adolescents and nowhere does religious education founder so completely as in its frequent denial that there is anything left to talk about after having (to quote the British Council of Churches) " affirmed as Christian the rule that sexual intercourse should be confined within the married state." That this state of affairs does exist in some schools is evident from Michael Schofield's book *The Sexual Behaviour of Young People*, in which one respondent remarks " the reverend told us not to do it, the doctor told us how not to do it, and the head told us where not to do it." Even some of Harris's headmasters were capable of remarks like " I am sick, sick of talk about sex, I will have none of it in my school," or " I am against frank discussion of these matters.'

In short, this book is an immensely stimulating and informative overview of the state of religious and moral education. A thoughtfully compiled booklist provides the interested reader with plenty of scope for further reading. There will be many interested readers.
KENNETH PEASE.

MAXWELL, J. (1969). *Pupil and Teacher : An Introduction to Educational Psychology.* London : Harrap, pp. 279, 30s.

MUNRO, M. (1969). *The Psychology and Education of the Young.* London : Heinemann, pp. 294, 25s.

These two books have overlapping subject matter, as may be seen from their chapter heads, and they are addressed to comparable audiences—teachers and potential teachers. But there the similarity ends.

Miss Munro's *The Psychology and Education of the Young* is a textbook, long, explicit and well indexed. Providing up-to-date coverage of many aspects of academic educational psychology, it seeks to instruct and inform. It does not make easy reading but the industrious student will find his efforts rewarded. Maxwell's approach is more selective. He aims to relate some of the many and diverse developments in modern psychological thought to teaching practices and ideas and to show what differentiates the psychologist's point of view from the teacher's. The book makes a lively and forceful impact, with its admirably clear expositions and occasional caustic comments. To the specialist the treatment of any particular field may seem cursory and inadequate, but Maxwell's ability to state a point firmly and briefly and pass on is in fact one of his great merits in the present reviewer's opinion.

General comparisons between these books taken as wholes are in many ways unfair to both but as what the writers exclude, what they emphasise, and how they treat what they include is crucial to the summed effect, a few illustrative contrasts may help. For instance, Maxwell devotes 7½ pages, Munro 17, to Piaget. Their approach shows a pattern elsewhere observable in the books. Maxwell starts by setting forth Piaget's views on cognitive maturation, with descriptions from some of his experiments, in five clear pages. Without going into great detail or referring to every theory he draws attention to the main features of Piaget's findings. " Essentially what Piaget is trying to do is to find the logical systems according to which children do their thinking at different ages." Some difficult ideas are explained in useful summaries. For example, of ' rigidity ' Maxwell writes : " The child is the prisoner of his cognitive structure and cannot think in terms of any scheme other than that which he has built for himself." Finally, he assesses Piaget's contribution, pointing out that it is essentially psychological. He concludes : " The psychologist's contribution to education is mainly to enable the teacher to distinguish what he does not know about children from what he does know. And the present position about the significance of Piaget's findings about children in relation to educational practice is that we do not know." The above is not the only occasion on which Maxwell is ready to admit ignorance. Miss Munro, though she considers that Piaget's ideas fit in with modern teaching methods (e.g., activity), also recognises the ambiguities and difficulties of his views. Her discussion of these actually opens with some criticisms and afterwards she proceeds to elaborate a detailed exposition, covering many aspects not touched by Maxwell. Her account of Piaget's thinking, replete with definitions of his major concepts, is remarkably thorough, but inevitably (considering the master's well known obscurities) the clear impression derived from Maxwell's account becomes blurred. The reader no longer feels that Piaget is as ' comprehensive and enlightening ' as Maxwell claims.

Differences in emphasis mean that some topics are virtually peculiar to each book. Language, for example, has two chapters and many references in Miss Munro's, while it occupies only a few pages and paragraphs in Maxwell's. By contrast, the subject of personality gets two chapters in *Pupil and Teacher*, while it is only briefly covered in *The Psychology and Education of the Young*. Children's thinking is dealt with in numerous scattered passages by Munro, but Maxwell concentrates the whole of a 15-page chapter on it. Case histories, of which Maxwell has a few, are eschewed by Munro. Though educational measurement is naturally considered by both, the scope and method of their discussions is different. Munro makes a general approach, each sub-topic finding its place in context as it occurs, while Maxwell prefers analysis, with numbering off and listing (" four basic measures . . . ", " four characteristics of good assessment . . . "). Such issues as punishment, creativity, and heredity, are, as would be expected, very differently handled by each author.

Contrasts of the above sort must be taken into account by anyone deciding between the two books, according to his purposes. On a more absolute level of appraisal, it would seem apparent that Maxwell gives us something we have not quite had before. If the teacher reader remembers his training college studies in psychology (and many do) as an academic rut, he will be stimulated and lifted out of this by Maxwell. In *Pupil and Teacher* we have a volume which clarifies its subject and holds the attention. Its only defects are an inadequate index and a rather oddly organised bibliography. OLIVE C. SAMPSON.

PIAGET, J. (Trans. by Seagrim, G. N.) (1969). *The Mechanisms of Perception.* London : Routledge and Kegan Paul, pp. xxix+384, 80s.

What is the relation between perception and intelligence ? Is our knowledge about objects and events abstracted directly from our perception of them, the operations of intelligence being thus derived from those of perception, or does intelligence develop autonomously and itself play an active role in the processes of perception ?

Jean Piaget, in his studies on the development of intelligence—genetic epistemology as he has called it—has been very much concerned with this problem, and he and his colleagues at Geneva, particularly Marc Lambercier, have published a long series of studies on the development of perception in children. In 1961, Piaget published a valuable summary of these studies and a discussion of their relevance to the problem of the relation between perception and intelligence under the title *Les Mecanismes Perceptifs.* The English translation of this impressive work now makes Piaget's ideas and studies available to a much wider audience and completes the main gap in our knowledge of Piaget's original contributions to psychology.

The first two parts of the book comprise a discussion of these studies on the development of perception in children. Most of these experiments are concerned with the way in which the perception of various optical illusions changes with age. Piaget makes the useful distinction between primary perceptual effects and perceptual activities. The primary effects are those which may occur in a single fixation of the eye, and can be studied experimentally by using short tachistoscopic presentations ; Piaget describes the general relations which apply to illusions seen under these conditions. Perceptual activities are those processes which occur when perception depends on the integration of information from a number of eye fixations. These activities increase in variety and importance with age, and may lead to new secondary illusions.

These studies provide a useful contribution to the literature on visual illusions, but their main value is in providing evidence for a detailed analysis of the relation between intelligence and perception, which comprises the third part of the book. Piaget argues that the structures of intelligence, which represent our knowledge of objects and events, do not originate only from perception. He considers that intelligence develops mainly from actions, particularly sensory-motor activities, and that perception is very much influenced by intelligence, especially in the development of perceptual activites. The main contribution of this argument to psychology is to provide a general framework, in terms of a relational language, into which the more detailed theories and facts from experimental psychology and neurophysiology must eventually be fitted.

While this is a most impressive and important book, and essential for any library of education or psychology, it will be difficult reading for most students, mainly due to the high conceptual level at which it is written. The translation is very well done and great care has been taken with terms which are used by Piaget with a special or restricted meaning. In some cases readability has been sacrificed to accuracy, although this is partly justified by the complexity of the original language.

ANDREW GREGORY.

PIAGET, J., and INHELDER, B. (1969). *The Psychology of the Child.* London : Routledge and Kegan Paul, pp. xiv+173, 35s.

" In this volume we have tried to present, as briefly and as clearly as possible, a synthesis, or summing up, of our work in child psychology. A book such as this seemed to us particularly desirable since our published studies have been spread out over a number of volumes, some of them quite lengthy and some of them fairly difficult to read." This statement of intent by Piaget and Inhelder is guaranteed to elicit a heartfelt 'Amen' from students of cognitive development. In recent years the steadily growing stream of books devoted to introducing and interpreting the work of Piaget and his collaborators has attested to the generally felt need for a clear, comprehensive but brief statement of their position. With the translation of the present volume, first published in French in 1966, this gap has been filled in the most satisfactory way possible by a statement emanating from Geneva and, thus, presumably free from interpretive 'noise.'

The book comprises five chapters. Three of them are, predictably, devoted to an account of Piaget's familiar three stage model of intellectual development. The initial chapter deals with the six sub-stages of the sensori-motor level and the first steps in the child's construction of reality while the last two chapters are respectively concerned with concrete operational thinking and the stage of formal operations. The development of perception is considered in the first of the two intervening chapters which includes sections on the perceptual constancies and perceptual causality, field effects and the relationship between perceptions, concepts and operations. The theme for the remaining chapter is the semiotic or symbolic function. Topics covered under this heading comprise the developmental role of imitation, symbolic play, drawing, mental images, memory and language.

Since a brief review is hardly the place to embark on criticism of the outcome of forty years of research by Piaget and his collaborators only two general comments will be offered. These arise from the excellent opportunity which the book provides to gain an overview of the complete range of Piaget's theorizing and the inter-relationships of its numerous facets. In accounts of the contribution of the Genevan group it is usually stressed that their major objective is the production of a theoretical account of what Piaget has termed "the area of intellectual operations" and not a complete theory of the cognitive processes. The development of perception and of language are, for example, excluded. The treatment accorded to perception, language imagery and memory in the present volume provides grounds for questioning the accuracy of this emphasis Not only are these topics considered at considerable length but their inclusion is not simply a matter of juxtaposing the results of Piaget's work in these areas with his account of intellectual development. The theoretical positions adopted on these themes are fully integrated with the three stage model of intellectual development. In practice, whether by intent or not, Piaget appears to be moving appreciably closer to providing a complete theory of cognitive development.

A second widely accepted verdict on the Genevan group is that their interest lies, very definitely, in 'cold' as opposed to 'hot' cognition and, consequently, questions of feeling and affect and of social and interpersonal relations receive relatively little attention. This comment must, also, be revised in the light of Piaget and Inhelder's summing up of the import of their work. In the three chapters dealing with the three major stages in intellectual development the social and affective aspects of development are accorded an extended treatment and throughout the viewpoint adopted is that "the affective, social and cognitive aspects of behaviour are in fact inseparable."

It is asserted by the publishers that *The Psychology of the Child* constitutes both the best of all introductions to Piaget for the student and an excellent summary for the professional psychologist. The first of these claims must be accepted with caution. Although it has the great merit of being a first-hand production and is probably the clearest piece of exposition which has emanated from Geneva, it does not constitute an ideal introduction since relatively few concessions are made to readers unfamiliar with Piaget's terminology. Its framework could, however, prove to be a useful 'advance organiser' for students commencing the study of the Genevans' work. The second of the publishers' claims can be accepted without reservation. The book will undoubtedly be invaluable in helping to systematise the knowledge of researchers already familiar with the Piagetian literature. A source of disappointment among this specialist readership will, undoubtedly, be that the Genevans did not view the production of a summing up volume as a suitable occasion for the publication of a complete bibliography of their work.

J. G. WALLACE,

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